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AVIATION

The Oldest American Aeronautical Magazine

PRATT AND WHITNEY POWER LINKS "DOWN UNDER" WITH TWO HEMISPHERES

IN THIS ISSUE

NRA CODE

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AVIATION

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THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

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ON LEAVE OF ABSENCE

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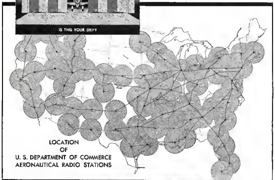

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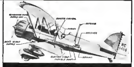

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In the September issue of AVIATION the author outlined the history and current status of the air forces of Czechoslovakia, Jugoslavia and Roumania. Continuing his study, he reviews military flying in Poland, Greece and Turkey.

The Equipment of Air Forces

POLAND, GREECE AND TURKEY

By Dr. Alois Robert Bohm

POLAND, re-formed by the Treaty of Versailles out of territory formerly belonging to Austria, Germany and Russia, realized very shortly after the close of the World War that an adequate service aviation was necessary for her protection. Her territory was large and was deficient in military roads, railroads and communication facilities. The newly formed Polish Air Force had an opportunity to prove its value at a very early stage in its career in 1920 when active warfare broke out against the Bolsheviks. At that time, however, Poland had to draw heavily on French manufacturers for flying equipment for her pilots.

The air force now comes under the Ministry of Military Affairs, and is under the command of Brigadier General Rayski. There are six regiments, each consisting of three divisions of three squadrons each and two balloon battalions. Officer pilots and observers are trained at the Aeronautical School of Deblin and there is a training school for under officers at Bydgoszcz. A bombing school and a school of fira are conducted at Grudziadz. The control of material and equipment comes under the laboratories of the Directory of Ravitaillement and under the Institute of Technical Aeronautical Studies at Warsaw.

In general aeronautical matters Poland is still very closely associated with the Air Forces of the Little Entente and France. Every year military units of these states compete in a flight "Round the Little Entente and Poland." Fighting squadrons of the several countries interchange frequent visits. For example, a group of 30 Polish PZL P XI under the command of General Rayski recently paid a visit to Bucharest where they were received by King Carol of Roumania.

Since there were originally no aircraft manufacturing plants in Polish territory, early equipment had to be purchased from England, France and Germany. It consisted chiefly of surplus war types, some of which were equipped with American-built Liberty engines. Purchase from abroad was continued through the first few years after the War, but today, thanks to the efforts of Polish authorities to make the country self-dependent and to create a first-class national aeronautical industry, all planes and engines of the Polish Air Force are produced in Polish factories. That this policy is sound shows up not only in the high standard reached by the present air forces, but also in the results attained by Polish pilots in civil competition. In the Challenge International de Tourisme Polish pilots with Polish material won out against heavy international competition in 1932, and were again successful in 1934 in bringing the cup back to Warsaw.

For its metallic structural materials, the Polish aviation industry draws upon the extensive metallurgical industries of Upper-Silesia. For maintenance and repair all flying equipment goes through government-owned shops or is sent out to some of the smaller manufacturing plants.

Polish National Factory

The oldest unit of the Polish aviation industry is the Polish National Aircraft Establishment (Panstwowe Zaklady Lotnicze) at Warsaw. The concern, which originally made use of the shops and hangars of a war-time German supply park, has just moved into a modern plant at Okecie near Warsaw. It is now the most important aircraft factory in Poland and is under the direction of an experienced engineer, Rumbowicz. A great many of the tools of this plant are of American make.

By due process of evolution, the single-seat fighter (PZL P XI) appeared in 1930 and was, at that time, one of the most efficient military planes of its class. It is a gull wing, strut braced monoplane of all metal construction, with riveted sheet duralumin spars, duralumin ribs and covering. In portions of the wing where stresses are not heavy, the duralumin covering is replaced by electron sheets. The fuselage is of monocoque type with transverse duralumin bulkheads and duralumin skin.

This airplane has been produced with a number of different power plants. With the original Bristol Mercury (or the alternate Gnome-Rhone K-9), it has a guaranteed speed of 217 m.p.h. at 13,120 ft., climbs to 16,400 ft. in six minutes four seconds and has a

JANE'S

Polish fighters Above, left The Hispano-powered PZL-P1X fighter of 1930-31 Above Backbone of the Polish service—one form of the PZL-PX1 Above right The PWS 10 with 450-hp Skoda-Lorraine engine.

service ceiling of about 32,800 ft. With the Gnome Rhone Mistral-Major (PZL P XXIX) the top speed is 251 m p h at approximately 13,100 ft, 239 m p h at about 19,700 ft, landing speed 68 m p h and climbs to 16,400 ft in six minutes 55 seconds These performances are practically duplicated with a Rolls-Royce Kestrel engine.

Podlasian Aircraft Company

This concern (Podlaska Wytwornia Samolotow) at Biala Podlaska, is also under the management of the engineer Rumbowicz and manufactures the PWS—10 single-seat high performance fighter, a high-wing monoplane built after the Fokker pattern fitted with a 450 hp Skoda-Lorraine engine. The single wing has wood spars and combination plywood and fabric covering It is mounted on cabane struts with steel strut bracings on both sides. The fuselage is of welded steel tubes, wire braced. The machine is arranged with fuel tanks which may be jettisoned in flight. Performance is given as 155 m p h top speed, climbs to about 16,400 ft in 5 minutes 40 seconds with a service ceiling of approximately 24,600 ft

For advance training purposes, the machine most generally used by Polish air forces is the PWS 12 S biplane powered with a Skoda-built Wright Whirlwind The machine is normally rigged as a two-seater, but may easily be transformed into a single-seater for acrobatic work It shows a top speed of 118 m p h and can climb to 9,800 ft In about eighteen minutes. PWS 19 is a two-seater reconnaissance and observation plane similar to the PWS 10 in general construction With a Pratt & Whitney Hornet H T 2, it shows a top speed of 158 m.p.h at sea level, climbs to 16,400 ft in seventeen minutes, has a service ceiling of about 23 600 ft.

Plage-Laskiewicz

Founded in 1920, and located at Lublin, this firm has produced a number of Wright Whirlwind powered Fokker FVII's very similar to the original in construction, and also a quantity of Potez 25s Its later models the RXIII and RXIV advanced training planes were designed by Chief Engineer Rudnicki They are powered with the Wright Whirlwind 220 and show top speed from 108 to 124 m.p h

A high wing cabin monoplane, the RXVI with obvious Fokker characteristics was designed for ambulance work Equipped with Dr Tintners' special shock absorbing mounting for stretchers, it took the first prize at the International Medical Congress at Madrid in 1933 The cabin can accommodate two stretchers, one above the other Top speed is 118 m.p h.

The only engine manufacturing plant in Poland is the branch of the Czechoslovakian Skoda Works which turns out the Skoda Lorraine engine of 450 hp and also builds Wright Whirlwinds under license

A portion of the Hellenic air forces—Moranes and Breguets.

JANE'S

Greece

Modern service aviation in Greece dates from May 1931, when the older Military Air Service and Naval Air Service were amalgamated into the Hellenic Air Force under the direction of the Air Ministry The unit now consists of three army cooperation mixed squadrons and a naval group In organization and in equipment the Hellenic Air Force reflects foreign influence chiefly British Training and organization are modeled on the British pattern and a number of officers have been trained in England and in France A British air mission has been cooperating with the Air Ministry in the development of the air forces

Observation squadrons are equipped chiefly with Breguet XIV and Breguet XIX ships with Renault, Lorraine and Hispano engines Fighting squadrons have a number of old Spads and Sopwith single seaters as well as the more modern Gloster Mars, fitted with the Siddeley Jaguar engine There are also a number of Armstrong Atlas machines with the Jaguar engine for fighting reconnaissance purposes General purpose types include the Breguet XIX and a number of Potez 25 T O E with the 500 hp Hispano engine. For naval reconnaissance purposes the Fairey III with the Napier Lion engine is in service A squadron of Hawker Horsleys serve for coast defense and torpedo attack Training equipment includes a number of Avros (Lynx and Mongoose engines) Bristol fighters (Falcon engines). Morane monoplanes (Salmson engines) and DeHaviland Moths (Gypsy engine)

Although most of the Greek aeronautical equipment has been purchased abroad there is one domestic manufacturer, the Greek National Aircraft Factory at Old Phaleron which was erected in 1925 to produce designs of the Blackburn Aeroplane & Motor Company of England under license This shop has turned out several of the Blackburn Velos torpedo planes a number of Armstrong Atlases and some Avro 504s for both sea and land training The equipment of the factory is also available for maintenance and repair for the service squadrons

The Greek Air Ministry maintains meteorological services which are of great importance not only to the Greek Air Forces but also to commercial and general aviation activities in the eastern end of the Mediterranean.

Turkey

To date, service aviation in Turkey has been administered separately by the Departments of War, Marine and Communications It is well known, however, that Kemal Pasha is very much interested in aeronautical matters, and it is not unlikely that an independent Air Ministry will be formed in the near future Cooperating with government aviation officials, but not in any sense a government institution, is the Turkish Air League It organizes local meetings of the citizens in outlying districts in the interest of air defense and collects money for the purpose of equipment for the Turkish Air Forces

Turkey, like Greece, relies upon outside sources for some of her aeronautical equipment as there are few local factories. The Curtiss-Wright Company opened a plant two years ago for the manufacture of Curtiss Hawks. This plant was originally staffed with engineers and technicians from America but they have gradually been withdrawn and the plant is now operated with Turkish personnel One previous attempt to establish an industry in Turkey had proven abortive The German firm of Junkers put up an aircraft and engine factory at Kaisarieh in 1925, but never got into production due to difficulties which arose with the Turkish Government

The present air force equipment consists of Breguet XIV and Breguet XIX for general purpose work Hanriot, Morane-Saulnier and Curtiss Fledglings for training purposes Single-seat fighter squadrons are equipped with 24 Curtiss Hawk single seat machines (700 hp Wright Cyclone engines) Other equipment includes a number of Junkers A20s, Letov (Czechoslovakia) S116s and very recently a squadron of six Supermarine Southampton flying boats, each equipped with two geared Hispano engines

An announcement in *Motor Digest* (British) indicates that the Turkish government has just signed a contract for 36 Dewoitine single-seat fighters with Hispano engines for delivery in three lots of twelve machines each during the coming year Colt's armament is specified.

Turkish Air Service headquarters are at Angora Certain officers have been attached to British Air Forces from time to time for training purposes The air force proved effective in breaking down the Kurdish revolution in 1928-29

Turkish types Left: Cyclone powered Curtiss Hawks form Turkey's fighter squadrons Above Turkish Junkers A-20 for reconnaissance Below Six Supermarine Southampton flying boats (two geared Hispanos) similar to this R A F unit have recently been added to Turkey's Air Force

JANE'S

Insurance coverage for an air transport operation is one thing, for the flying service operator, another. In the following article, the author discusses an insurance program for the fixed base operator or flying school proprietor whose equipment may include from one to five airplanes.

Insurance for the Flying Service Operator

By J. Brooks B. Parker

THERE ARE so many forms of insurance available, that the operator should look at his problem with two thoughts in mind first "What do I absolutely need for my protection?" and, second, "Can I swing it financially?" If he can swing the insurance that he feels is absolutely necessary he should then consider the additional forms which reduce the hazard of operating his business.

Outlining first the more important types of insurance that are available, they are as follows

I The liability covers, sometimes called third party insurance, assuming,
- (a) The statutory liability of the employer to his employees This is called compensation insurance and is required by law in all states having compensation acts.
- (b) Liability of the employer to his employees under common law This applies in any states not having compensation laws and in those states having compensation laws when the employees do not elect to accept the benefits of the act
- (c) Liability for personal injury or loss of life to the public, other than passengers, i.e., public liability
- (d) Liability to passengers for personal injury or loss of life commonly called passenger liability
- (e) Liability for damage to the property of others commonly called property damage.
- (f) Liability of the airport owner for personal injury or death due to the operation of an airport, commonly called airport liability.
- (g) Liability of the owner or operator of a hangar to his tenants for damage which their property might sustain due to his negligence commonly called hangar keeper's liability

II The insurance on specific property,
- (a) On aircraft
  1. Covering against the risk of fire, either including or excluding fire resulting from crash.
  2. Tornado and windstorm insurance.
  3. Crash insurance.
  4. Theft insurance
  5. Land damage insurance
  6. In the case of seaplanes, mooring insurance
- (b) Other property.
  1. Buildings (a) Fire insurance. (b) Windstorm and tornado insurance.
  2. Contents of hangars, such as spares machinery, etc. (a) Fire insurance (b) Windstorm and tornado insurance

The operator who would attempt to carry all these forms would obviously never make anything out of his flying service There are, however, certain essential ones which he definitely should carry These are first, the compensation and certain of the liabilities, insurance which are essential because the operator does not know the amount of damages that may be given against him in the event of a court verdict for death or injury resulting from an accident, and he should therefore insure against having a blank check outstanding against his business The operator should also carry compensation insurance which usually carries with it employers' liability protection If he is in a state where there is no compensation act (Arkansas, Mississippi, Florida and South Carolina, all non industrial states), he should most certainly carry employers' liability insurance

In every state having a compensation law (excepting Alabama) it is required that the payment of the benefits under the act be guaranteed, by insurance, self-insurance, or by evidence of financial ability, usually a bond The requirements of the Superintendents of Insurance for self insurance and the posting of a bond are as a rule beyond the means of the individual operator and he is, therefore, faced with the necessity of taking out the insurance either with an admitted company or the State Fund (if there is one), or facing the penalties of not carrying compensation insurance If he does not elect to subscribe to the act, then he usually loses the three common law defences of negligence of fellow servant, assumption of risk and contributory negligence, which means that if an employee is injured, it is relatively simple for him to collect The compensation act that has become almost universal in this country is one piece of social legislation that is eminently fair, for the individual who is injured in line of duty through no fault of his own should receive some compensation

The cost of workmen's compensation insurance varies markedly in the different states (see table on page 385) because each has different benefits provided under the different compensation acts In most states, employers' liability insurance is included without additional cost to provide for the contingency that the employee may not accept the benefits of the compensation law and elects to sue under common law In the four states previously mentioned, employers' liability insurance should very definitely be carried

Public liability

This form of insurance, which will probably eventually be called personal injury insurance in the same way that it is being renamed under automobile insurance, assumes the operator's legal liability for death or injury suffered by the public, excluding those who are flying as passengers in his plane The cost of this insurance is comparable to that of automobile insurance, although automobile insurance covers the guest passenger as well For the limits of $5,000 any one individual, $10,000 any one accident, the cost of insuring a Waco or a Monocoupe, or a plane of similar type, is approximatley $75 and may be as low as $50 for a private flyer with a transport license The cost is insuring an automobile of equivalent value in New York City, for the same basic limits, would be $99

Passenger liability, for those who carry the public for hire, is important. In states where there is a statutory death limit, it would be possible to insure a minimum amount per person, based on the statutory limit, if the operation of the plane were confined to that state and there was any assurance that all accidents would be fatal This limit does not restrict the amount which can be awarded in cases of severe injury, however, and most certainly does not adequately cover in states which have no limitation of liability There is always the possibility that clever legal talent can transfer jurisdiction to a court outside a state with limited liability It is therefore wise for the operator to carry $20,000/40,000 limits The cost on a plane of the type mentioned above would be approximately $275

The matter of limits is exceedingly important Verdicts (in non-transport cases) in many cases have run as high as $25,000 The small operator could cover his liability insurance for limits of $20,000/40,000 and be fairly sure that it would be adequate

The damage to property of others is a very important form of coverage and, while there is not the probability of such substantial losses, the greater frequency of property damage claims makes the cost of this insurance approximately the same as public liability The cost is approximately $70 for $1,000 limit of liability which limit can, of course, be increased for an increased premium

The other forms of liability coverage, for the individual who is trying to run a perfectly fair business, may, if he operates with great care, be set aside until such time as he can see his way clear to finance them In other words, the ones mentioned above are absolutely essential and the others are less essential.

Certain inadequately financed operators and those who feel that their methods of business will permit them to do so, put all their property in the name of a dummy corporation. This is not as safe as they think it to be, for the courts have a way of going behind these subterfuges and finding the name of the real individual from whom they can secure the necessary funds to pay a just claim If the operator does not carry these forms of insurance, he is not rendering the proper type of service regardless of how well he can fly He is taking people up, encouraging them to enjoy the experience of flying and to a point is doing splendid missionary work for the aviation industry as well as making himself a livelihood, but is inviting legislation in connection with financial responsibility The operator who carries insurance is doing his part for the aviation industry and protecting its future against arbitrary laws. He is at the same time, protecting himself from the chances of being put out of business. his remaining property being taken away from him, and against further possibility that because of a judgment he may have to devote some part of his earnings for many years towards paying off claims.

J. Brooks B. Parker

Property insurance

It should be very clearly recognized that property insurance, discussed hereafter is absolutely different from property damage insurance, as property damage insurance covers damage to the property of others and property insurance (the type referred to here) is damage to the property owned by the operator or in which he has an insurable interest

Unless the operator carries fire insurance on his planes and hangars, he is not running a business but merely speculating on his future. His capital investment is entirely unprotected and as a result he may be wiped out if not backed up by sufficient capital to replace the equipment Most operators running one to five-ship services are not so fortunate as to have free funds to enable them to replace the money-making part of their business in case it is destroyed Fire insurance is therefore one of the most important forms of insurance that they can carry. Whether the insurance is written for fire on the ground only or includes fire resulting from crash is for the operator to determine This latter protection is more complete but is also more expensive Rates run from 2½ per cent to 5 per cent depending upon the relation between the insured value of the equipment and the new value, the fire con tents rate of the hangar, and the form of fire cover purchased The principal objection to insuring fire resulting from crash is that it is so very difficult to tell what was damaged in the crash and what in the fire.

Windstorm and tornado insurance is extremely important in certain sections of the country and less important in others By those operators who are based in the so-called tornado and hurricane belts it should very definitely be carried The cost runs from ½ per cent to 2 per cent, depending upon the location and the relation the insured value bears to the new value

Crash insurance is one of the less essential forms of coverage if the operator is unusually careful If he isn't, it is highly desirable to the operator and distinctly undesirable to the underwriters. Because of the selection

Compensation Charges in Selected States

There are a number of states which do not use the rates of the National Bureau of Casualty and Surety Underwriters.

Classification 7408 is a basic charge on an arbitrary salary It reads "The rate for this classification shall be applied to the payroll of all employees properly assignable as determined on the basis of a fixed wage of $4 per day for each pilot or co-pilot and $6 per day for other employees for each and every day of the period of employment. Surcharges for flying time of all pilots and co-pilots shall be made in accordance with the following schedule" Basic classifications follow

New Jersey	3 93*	Georgia	3 92
Illinois	3 08	Oregon	5 37
Kansas	3 39	Maine	3 97
Missouri	4 04	Minnesota	5 20
Michigan	4 91	South Dakota	3 54
New Mexico	3 33	Washington	3 88

Classification 7404 Aircraft operation—all flying employees—private pleasure aircraft sales demonstration or delivery photography mapping or survey Aircraft to have approved type certificate and to be flown by licensed pilot in accordance with Department of Commerce regulations" The rate charged is an additional $1 25 per pilot flying hour for each hour of operation for all states listed in Classification 7403

Classification 7405 Aircraft operation—all flying employees—aircraft engaged in transportation of executives employees guests or express in conduct of assured's business sightseeing taxi or special charter flights, testing approved type certificate aircraft or instruction. Aircraft to have approved type certificate and to be flown by licensed pilot in accordance with Department of Commerce regulations" The rate charged is an additional $1 50 per pilot flying-hour for each hour of operation for all states listed in Classification 7403.

*Rates are for $100 of payroll.

against the insurance companies that is to say, only those purchase it who are sufficiently fearful of crashes to warrant their paying the high rates, the rates remain high. If crash insurance could be written on all the aircraft of this country, it could be covered for less than 5 per cent per annum. As it is, crash insurance is merely taken by those operators who feel the particular need of it for one reason or another. Crash insurance on a plane of the type mentioned above varies markedly. It runs from an average low of 11 per cent to an average high of 16 per cent per annum.

Theft insurance is distinctly one of the less essential forms of coverage at the present time. It has one very distinct advantage in that it covers crash resulting from theft and may be purchased at a rate of from $\frac{1}{4}$ per cent to $\frac{1}{2}$ per cent per annum. It is a fairly remote hazard as evidenced by the rates.

Land damage insurance covers the damage sustained by the insured aircraft while on the ground by contact, under its own power, with another object or by being struck by another moving object, as long as it is not taking off or landing. It might more briefly be described as collision sustained except while in flight. The rates range from $\frac{1}{2}$ per cent to $1\frac{1}{2}$ per cent.

Mooring damage insurance, in the case of seaplanes, is fairly important as it covers practically the same perils on the water as land damage does on the land, plus dragging of the mooring, breaking adrift, marine perils, etc. The rate is about the same as for land damage.

Other property, such as buildings and contents, is easily insurable, the buildings at the existing fire rates established throughout the country by the various fire rating agencies, and the contents partly under the fire companies' and partly under the aircraft companies' coverages. The same applies to windstorm and tornado insurance. The very best hangar would carry a fire insurance rate of 30 cents per $100 or even less and the very worst hangar might carry a rate of $7 per $100. The contents of the hangar is a guiding factor in the rate. Aircraft are admittedly at present at least of a combustible nature and consequently the rates recognize this fact.

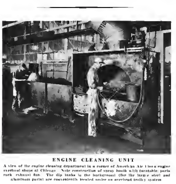
Tornado rates depend so entirely upon the construction and the locality that they had best be determined by any operator who desires them through his own individual broker.

This brings up the question of why an insurance broker is of value to an assured. It is because he is a specialist in insurance, just as a lawyer is a specialist in law. Insurance is a technical subject and insurance policies are highly technical legal documents. No individual, however competent, who is trying to operate a paying flying service, can take time to learn the insurance business too; consequently it behooves him to engage the services of the best broker he can find. Fortunately it costs no more to have his insurance handled by an expert than it does to have it mishandled by someone who is temporarily in the insurance business.

It should be remembered that the broker is the representative, not of the insurance company, but of the insured. If he is good he knows all the available markets and is in constant touch with them, thus being able to secure for his assured every possible advantage as soon as it is available. If unusual circumstances arise, he is able to write up the necessary coverage in such a manner as to be not only acceptable to the assured but salable to the insurance company. He is constantly on the alert to reduce rates and to apprise the assured of legislation or action on the part of the assured which would tend to increase the rates.

Attempts have been made by groups of individuals to get together under special forms of coverage, to secure lower rates. Insofar as this makes the operators realize the problems of the underwriters and vice versa, it is highly desirable but this group buying of insurance is becoming less and less possible because the insurance laws frown upon any discrimination between the buyers of insurance, no matter what form of insurance it may be. In addition the taking of a group and rating it on its experience as a group is attempting to make selection out of spread. Selection (good risks) is the only basis on which aviation insurance should be written at the present time, for spread has been and always will be disastrous in practically every form of insurance until the quantity insured is so great that the adverse experience of spread becomes nullified by the automatic inclusion of a great quantity of selected risks.

Recapitulating, the flying service operator should first find a competent insurance broker. He should then have his broker arrange for him compensation or employers liability insurance, public liability, passenger liability (if he carries passengers) and property damage insurance. He should also carry fire insurance both on his aircraft and on his fixed property. He should run his operation with the maximum of care and carry his own crash insurance until he can secure it at a rate of less than 10 per cent. He should study his own particular problem to see whether he needs such other forms of insurance as tornado insurance, theft insurance, mooring insurance and land damage insurance, and he should cooperate in every way to help the insurance companies realize that he senses their importance as a protection to him and his financial future. After all, the rates charged are what the operator makes them.



ENGINE CLEANING UNIT

A view of the engine cleaning department in a corner of American Air Lines engine overhaul shops at Chicago. Note construction of spray booth with turntable parts rack, exhaust fan. The dip tanks in the background (for the larger steel and aluminum parts) are conveniently located under an overhead trolley system.

Taxiing in to the New Bedford float.

Short-Haul Seaplane Service

By Beekman L. Fairbank

At a time when the trend is toward long range, high speed air transport, consider the accomplishments of Island Airlines, a short haul operation, one of the few scheduled seaplane services in the country. It demonstrates what can be done without benefit of mail contract by the full utilization of a favorable situation.

ISLAND AIRLINES, INC. operates between New Bedford, Mass. and the islands south of Cape Cod (Nantucket and Marthas Vineyard), with a stop at Woods Hole. The traffic consists almost entirely of summer residents or vacationists from either New York or Boston. New Yorkers usually arrive by boat at New Bedford while Bostonians come by train to Woods Hole. In either case they are deposited at the dock of the steamer which serves the islands. The boat service is operated by the same company which runs the New York boats, and is also a subsidiary of the New York, New Haven and Hartford Railroad. Because of this close coordination of other means of transport, it is essential for the airline to have its facilities equally accessible to the passenger as he gets off the train. With this in view, and also to avail itself of the widespread facilities of the railroad company, Island Airlines has come to an agreement with the latter whereby not only does it use the railroad docks at all stops, but reservations can be made through any of the railroads or steamship agents. Instead of trying to fight existing transportation systems, the airline cooperates without losing its status as an independent company.

Since the route is short (50 miles), the actual flying speed is a matter of comparatively little importance and success depends primarily on close cooperation between the various stations. Passenger turnover is very high, and it is essential that the agent at each stop know at all times the number and destination of all passengers aboard each ship. To this end all stations are connected by teletype so that just before each trip and as the plane takes off after each stop, the number of passengers aboard for each station, the amount of express and excess baggage and time of departure is put on the tape. In addition, all future reservations and cancellations are recorded. All reservations must be approved by the chief dispatcher at New Bedford, for many passengers make reservations a week or so in advance or have a standing reservation for certain trips.

Many passengers come from fairly distant points for a short stay on the islands, and the time saved by flying is considerable. A passenger, for instance, who arrives by boat from New York reaches New Bedford at 7 in the morning. By plane he reaches Nantucket by 7:30. By boat he gets there just before lunch. On the return trip, if he flies he can leave the island after an early dinner in the evening. By boat he must leave at 2:30 in the afternoon. The plane schedule makes a direct connection with the Fall River and New Bedford boats from New York, and most of the trains from Boston.

From the nature of the traffic it is obvious that the line is subject to a highly varying volume. Week-ends and holidays usually triple the usual number

of passengers Fortunately the route is so short that the peak loads can be handled with only the two ships usually in service One plane takes the local passengers, making all stops if necessary, while the other runs express from New Bedford to Nantucket. Each returns as soon as possible for another load It is possible to run four or five sections with the two ships and still save the passengers in the last section two hours over the steamer schedule. As many as 76 passengers have been handled over the line in a single day by this method All maintenance work is done during the week when the schedule can be flown with one ship

A considerable charter business has been built up also to prevent the ships lying idle any more than necessary, but except in emergency, it is always subordinated to scheduled flights, and if it appears that the ships will be needed for the regular run the charter is not accepted Customers have shown a surprising willingness, however, to delay their charter and pay rates slightly higher than those of local airports to get regular airline ships and pilots. A small percentage of the charters are emergency cases, news picture flights, etc., but the majority are sightseers or summer residents who are in no particular hurry and prefer the plane ride to the boat

The line operates with very low overhead Landing facilities at each stop consist merely of a small float, approximately 20x20 ft., laid alongside the steamship dock, and an office with teletype and telephone connections. At night the ships are moored in New Bedford in a protected place, and all maintenance work is done here Any work which requires extensive shop facilities is done at Boston by company mechanics, but all routine checking, minor repairs, etc, is done with the ships in the water Flying equipment consists of Wasp powered Fairchild 71's on Edo floats, which are equipped with the usual blind flying instruments but not with radio The route is short, and ships are never more than twenty minutes from a station so it is felt that the added weight and complication of radio are not offset by the advantages In case of any sudden change of weather (fog is the usual complaint in the region) the next station over which the plane will pass is notified by teletype and the agent signals the ship with a large yellow flag which the pilots must not pass under any circumstances

By careful coordination of duties, the two-man fleet crews are able to unload and reload six-passengers (with baggage) and have the ship away again five minutes from the time it touches the dock

Maintenance afloat. Note the working platform laid across the floats and the canvas screen to prevent tools and parts falling into the water

Make service conspicuous

Island Airlines operates under a series of somewhat unusual conditions (1) The only competing transport is (comparatively) very slow. (2) The traffic is made up of the more-than-average wealthy to whom the appeal is convenience and safety rather than price (3) The route is short with frequent stops and high passenger turn-over, necessitating a full utilization of plane capacity if any profit is to be made (4) The ground transportation systems are so coordinated that unless the plane service is made equally simple and prominent, the traffic will go by boat There are probably many other potentially good set-ups of a similar nature elsewhere which, if properly approached, might be successfully developed

Scheduled services and reasonable rates are, of course, potent factors in attracting customers to any airline, but to meet certain of the conditions outlined here for a short haul service with close ground competition the services offered must be conspicuous and access to them must be as convenient as to the competing forms A potential transcontinental air traveler is usually willing to go to some inconvenience to get rates, to figure time saving, and to get to and from remote airports but for short haul work he usually makes a snap decision on the spot between air or ground travel and it is up to the airline to make itself obvious enough to receive its due consideration Much of the success of Island Airlines can be attributed to the fact that its seaplanes dock right at boat and railroad terminals, and it is just as convenient to buy tickets, board planes as it is to embark on waiting steamers This is a point that should not be overlooked by operators faced with a similar set of circumstances

The classic difficulties involved in eating one's cake and having it too may sometimes be avoided by applying one of several recently developed methods of determining the fitness of materials in aircraft structures.

Non-Destructive Materials Testing

By Herbert R. Isenburger
St. John X-Ray Service, Inc

BY TESTING to destruction selected samples of the materials that enter into the construction of airplanes and engines, it is possible to check their average physical properties against standard values set up by long and rigorous research Engineers now have at their disposal sufficiently accurate data to solve satisfactorily the perennial problem of maximum strength with minimum weight The question may always arise however, as to how accurately the samples selected for test represent the true condition of the material entering into the final structure. One slight internal flaw or defect may easily wipe out all calculated factors of safety. Fortunately, the problem is not insoluble. Methods are now available whereby the actual condition of the internal structure may be examined without impairing the strength or final usefulness of the part in question.

Of a number of non-destructive testing methods that have been devised, the more important for aircraft inspection are magnetic analysis and radiographic examination Two variations of each type are successfully employed (1) magnetic analysis by comparison with a standard material, (2) magnetic analysis by the use of metallic powder, (3) radiographic examination by means of X-rays, and (4) radiographic examination by gamma-rays

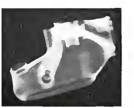


Fig 2 X-ray photograph of aluminum casting for inlet valve housing

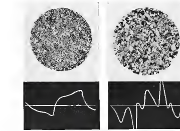


Fig 1 Typical magnetic analysis curves for nickel steel aircraft bolts (Reid) Left: Magnetic curve and structure—normal hardness Right: Magnetic curve and structure—low hardness

The first method is necessarily confined to materials of simple shape, such as small diameter seamless tubing, bars and rods, etc By comparing the magnetic properties of the material with a standard sample the metallurgist is able to check up on heat-treatment (whether the steel is properly normalized, annealed, decarbonized) and on magnetic permeability of stainless steel Welding rods for example have been checked for uniformity in this way

The application of magnetic analysis to S.A.E. 2330 nickel steel bolts is shown in Fig 1 (Courtesy L. S Reid). Specifications called for minimum of 125,000 lb per sq in. tensile strength, and a hardness range from 27 to 32 on the Rockwell C scale The purpose was to determine if the speci-

fied heat-treatment had been applied. The first curve (left) shows a typical magnetic wave form of correct hardness range. The grain size is normal as shown in the micrograph. Comparing two bolts, one having normal hardness range and the other being low, yields the irregular wave pattern shown (right). The grain size of the unsatisfactory material is also shown. This method is now being used to analyze ferrous aircraft materials for differences in carbon content, hardness, etc. It does have certain inherent limitations. The chief difficulty lies in the proper interpretation of the wave forms —no job for an amateur. Also, the inspection must be performed before the parts are put into the structure. Although this method permits a rough segregation of good and bad material on the above basis, it does not yield any indication of the mechanical soundness of the interior.

Another magnetic analysis, the powder method sheds some light on the question of internal integrity. The part is first magnetized and a special metallic powder is dusted over it. When it is tapped lightly the powder falls off, unless there is a flaw at or near the surface. In this case, the break in the metallic magnetic path causes an abnormal concentration of magnetic flux at the defect, and its shape will be found outlined with a ridge of powder. A great variety of airplane parts can thus be tested, such as engine connecting rods, crank shafts, cylinder blocks and heads, tube welds, propeller blades, hubs and straps. Experience with this method has made it possible to locate defects of design and application which may lead to fatigue failures. If discontinuities lie considerably below the surface however, the method falls down, for the flux leakage becomes less sharply defined with increasing depth. Occasionally defects lying as much as ½ in. below the surface may be found, but they are normally out of range.

X-ray examination

Magnetic analyses of whatever type are applicable only to ferro-magnetic materials. Radiographic examination on the other hand can be carried out on any kind of material and is the only non-destructive test which will yield indications as to the nature of a defect as well as locate it. Such inspection should be applied from the earliest stages of manufacture, and should be carried through to a final check of the entire assembly before the ship leaves the factory. Serious defects may develop while the plane is in service, and severely strained parts should be radiographed at every overhaul period.

Since most aircraft members are of relatively thin cross-section, a comparatively small x-ray machine will do the work. Compact and flexible units suitable for field and factory use have been

Fig. 3. Container for radium for use in gamma-ray photography

developed and are on the market. The latest machine developed by the writer's organization, for example, consists of only three parts which weigh about 200 lb. altogether. The power generator and controls are housed in one case, the tube and its high-tension cables in another one. This outfit is capable of penetrating 1 in. of steel in one minute.

Fig. 2 is an exograph of the inlet valve housing for an engine, representing a good aluminum casting. This particular picture was made on sensitized paper instead of film. Since the paper tends to give somewhat less contrast than the film, it is possible to see the thinner sections of the casting as well as the thick ones. This new medium for recording radiographic evidence has other advantages over film, the most important being lower cost. The price for paper is just ⅓ that for film. Considering that some manufacturers have been using from 750 to 1,000 ft. of film a month on x-ray inspection work, the saving involved by the substitution of paper may amount to as much as $200 a month.

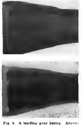


Fig. 4. A landing gear fitting. Above: A gammagraph. Below: An exograph

Use of gamma-rays

Gamma-radiation from radium may also be used to make sub-surface photographs. The method lends itself to field inspection because of the ease with which radium can be brought to the object. A container for radium is shown in Fig. 3. This in turn, is carried around in an outer container having 2 in. of lead all around. Extreme precaution is necessary, because continuous exposure to gamma-rays is dangerous to human tissues. As it is, the 2 in. lead sheath will allow about 1 per cent of the rays to come through. Definition and contrast in a gammagraph are not as good as can be obtained in an exograph, scattering is almost eliminated, an important consideration when examining concealed parts.

It is possible to make pictures of a number of parts or of several joints of the same fuselage at once. The radium in its container is placed about in the center of the group of objects to be studied, and properly mounted photograph films are exposed behind them. The length of time allowed for each exposure is varied depending upon the thickness of the part and its distance from the source of the gamma rays. The author has developed a special technique for obtaining sufficient detail in a gamma-ray picture, an accomplishment hitherto impossible on account of the comparatively thin sections employed in aircraft materials. Fig. 4a is a gammagraph showing defective welds in a complicated landing gear structure. The fine lines at both sides of the part indicate lack of fusion and the rounded spots in the center of the piece are porosity. The same part has been x-rayed and the result is shown in exograph Fig. 4b. Here the better definition and greater contrast are clearly noticeable. This would indicate that in general the x-ray examination is preferable where it can be used conveniently.

Making use of new tools

Non-destructive testing is another form of insurance against accident. During the last two years the total mileage flown by commercial transport ships has increased rapidly and the accident rate (in terms of fatalities per passenger-mile) has also shown substantial improvement. Accidents still happen, however, some of which may be traced to material failure. The total elimination of this factor can be attained only if each manufacturer and operator of airplanes uses every means at his disposal to inspect ships most carefully. Magnetic analysis and radiographic inspection are new tools which offer ways and means of greatly reducing the hazardous features of poor material and faulty workmanship.

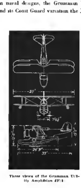
Grumman Utility

The secrecy that must surround military and naval aircraft frequently withholds the details of marked advances in the designer's art until the type concerned is approaching obsolescence. AVIATION is therefore particularly fortunate in being permitted to give here a full description of one of the most interesting of modern naval designs, the Grumman Utility Amphibian JF-1 and its Coast Guard variation the JF-2.

SEVERE design conditions are by no means limited to projects calling for record breaking performance of some particular function. They can be encountered in equally formidable proportions in the development of an aircraft to discharge a multiplicity of duties with a uniform and high degree of efficiency. Certainly few engineering staffs would have envied the Grumman Aircraft Engineering Corporation the task that faced it when it was laying out its utility amphibian.

The Navy was seeking a high performance plane to be useful in so many roles that it was hardly practical to list them. An amphibian it must be certainly. Beyond that the specifications called for use in target towing, aerial surveying, fleet photography on "expeditionary" missions, as a "utility" plane and as a "utility" plane carrying more than normal fuel load. The craft had also to be designed for catapulting, carrier deck landings, and full radio equipment.

That they got what they wanted is reflected in the orders which are bringing the Navy's quota of Grumman Amphibians up to 22 and sending nine more to the Coast Guard, the latter service relinquishing many of the military armament requirements but adding several of its own to facilitate rescue work.



Three views of the Grumman Utility Amphibian JF-1

In general terms the ship is an equal span biplane with moderate stagger, a non-convertible amphibian, that is its fuselage structure is continued integrally into its float hull and of all metal construction with the exception of fabric covering on wings and movable control surfaces. The Navy's planes of the JF-1 model are powered with Pratt & Whitney twin row Wasps. Those delivered to the Coast Guard are designated JF-2 and mount the Wright Cyclone.

Loadings vary under different conditions but in the "normal utility" condition weight empty is 4,114 lb., useful load 1,257 (including two people, 100 gal. of fuel, and 8 gal. of oil) gross weight 5,375. So loaded the JF-1 has a top speed of 170 m.p.h., climbs to 5,000 ft. in 4.7 minutes, lands at 61 m.p.h. The JF-2 on which full performance figures are not yet available is believed to have substantially similar performance. Other Navy loadings carry the gross weight to 5,800 lb., provide for four people.

The spars are of 17ST aluminum

alloy Flanges are extruded channels connected by web plates which are placed alternately on front and rear faces (See sketch.) Ribs, furnished by Fleetwings, Inc., are of shot welded stainless steel truss construction The interplane structure is especially interesting The two upper panels meet at the center line of the ship but are not externally braced at that point, although vertical tie rods from the fuselage do pass between them to anchor a hoisting sling There are no diagonal cross-bracing wires between the center section struts Instead, a nearly vertical wire connects each front strut point with a fitting on the lower part of the fuselage, and another connects the rear strut point with the fitting on the lower front spar Lift and anti lift wires in the wing cellule proper are all located in the plane of the lower front and upper rear spars

Ailerons driven by a rod and crank mechanism in the lower wing have a formed 17ST framework and are of the Frise type The streamlined strut connecting the top and bottom aileron is placed in front of the hinge line to eliminate all possibility of flutter

The fuselage float hull, and the compartment connecting them are of all-metal monocoque 17ST construction. The single step hull is simple in design Its internal bracing is of the cross-floor truss type with longitudinal stresses taken by the skin with some reinforcement from chine and keel, and from inverted U members riveted to the top deck of the forward section. Within the hull are housed the 150 gal fuel tank the retracted landing gear and the lower part of a utility cabin serving for everything from a target locker or mapping photographers workroom to space for two stretchers in coast guard rescue work To facilitate construction and maintenance the hull is largely assembled with truss headed machine screws. These also form the method of attachment between the hull and the fuselage.

The fuselage structure likewise consists of a stressed skin over cross-frames rather than bulkheads and is reinforced by comparatively light longeron members, which, incidentally, reverse the usual practice and are not continuous through the cross-framing. Connections are generally by rivets Throughout the entire hull and fuselage a great deal of care has obviously been paid to fairing and proper design of fillet radius

The landing gear retracts fully into the hull being operated by a hand winch through a system of chains and sprockets. Approximately 45 turns are required between the full out and the full retracted position, the weight being counterbalanced by a strand of shock absorber cord. The absorbing leg is of standard Cleveland Pneumatic Aerol type. Wheel brakes are by Bendix

The tail wheel also retracts as the landing wheels are drawn up It is provided with a locking pin so that, at the pilot's discretion, it can be locked in its centered position to decrease the possibility of ground looping

The all-metal fin is offset and fairs at the root into the fuselage structure. The stabilizer likewise entirely of aluminum alloy, is adjustable through a range of 8 deg from the cockpit The rudder and elevators are of 17ST framework but are fabric covered Trimming tabs for rigging adjustments are mounted on the ailerons and rudder

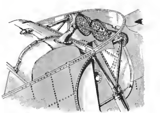
Accessory equipment includes an electric inertia starter with hand crank attachment, a generator, and complete shielding and bonding for radio

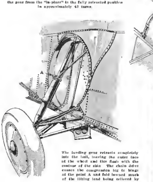
Tail group Fin and stabilizer are entirely of aluminum alloy construction Movable surfaces are fabric covered and are partially balanced dynamically The well streamlined fuselage tip is a good sample of the attention that has been paid throughout the design to aerodynamic efficiency

The wing structure Extruded channels of 17ST form the spar flanges. The web bracing consists of plates riveted alternately along the span to the front and rear spar faces Stainless steel shot-welded ribs are by Fleetwings, Inc Drag bracing, not shown, is of orthodox tie-rod design

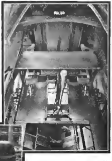
As the landing gear is retracted, the same mechanism draws the tail wheel out of the slipstream and shelters it in the hull structure Sketch shows the gear in half way retracted position The wheel is of the self-aligning, full swivel type, fitted with a caster locking pin controlled from cockpit The Aerol shock strut has a travel of 2½ in. The 6 in. by 2½ in. hard rubber tread wheel is equipped with roller bearings

Midship hull compartments are put to full use One is occupied by the 150 gal fuel tank A second houses the retracted landing gear and the chain and sprocket drive which actuates it. A hand crank in the cockpit raises the gear from the "in-place" to the fully retracted position in approximately 45 turns

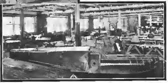




The landing gear retracts completely into the hull, leaving the outer face of the wheel and tire flush with the contour of the skin The chain drive causes the compression leg to hinge at the point A and fold inward much of the lifting load being relieved by the tension of the shock cord strand The Aerol strut has a travel of 4½ in.



Above A view into the hull cabin compartment through the rear cockpit This space serves many a useful purpose varying from a mapping photographers work room to a ward for stretcher cases in rescue work



Above and left The hull is assembled as one unit the fuselage and intermediate compartment as another Most of the joints in the hull structure and that between the two assemblies are made with truss headed machine screws Of interest are the steel bracket braces carrying part of the loads from the nose of the hull into the fuselage structure

OPERATION AT DESIRED CRUISING CONDITIONS, PART NINE

The "Trip" Time and Cruising Velocity

There is a substantial difference between the normal cruising speed of an airplane and the overall speed made good between take-off and landing points. In predicting this difference for schedule making, many factors must be taken into consideration. In the present article the authors discuss the relationship of level flight cruising speed to "trip" time in the light of previous contributions in this series

By Edmund T. Allen and W. Bailey Oswald

Fig 38: Times required for climb to and descent from altitude for the 75 per cent power, low-pitch maximum-rate climb, and 400 ft per minute descent. The effect of change in temperature is illustrated. Curves for true velocity at each altitude are included

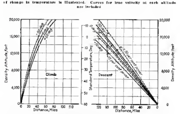


Fig 40: Distance traversed in the climb to and descent from altitude. The effect of temperature variation is shown. Climb is made at the maximum 75 per cent power rate with low-pitch propeller setting, descent is made at 400 ft. per minute true rate with high-pitch propeller setting

THE VALUE of an airplane as a commercial vehicle should be measured by its "block to block" speed (i.e., including take-off, climb, cruising, descent and landing), rather than by its absolute cruising velocity in level flight. In military operations, also, which depend for their success upon mobility, the total elapsed time required for any particular operation is of utmost importance. The pilot must know how his operation of the airplane in each portion of the flight affects the entire flight. The ground personnel also should know something of the capabilities of the airplane in maintaining schedules.

The relations between the velocity in each portion of a trip and the "overall" trip velocity can be obtained by the use of charts for the cruising climb, descent, and level flight developed in previous articles of this series. The methods of operation recommended combine to produce a result which generally may be applied in the establishment of schedules. For any particular case, however, there will often be certain requirements and limitations imposed which will make necessary modification in the method of operation in climb, level flight, or descent. It is recommended, therefore, that the terrain and other characteristic features of an airline be studied with relation to the performance of the airplane in order that maximum overall cruising performance may be attained.

The cruising climb and the cruising descent are controlled by the pilot by adjusting engine r.p.m. and indicated velocity simultaneously to the required values as shown on the charts. (AVIATION, November, 1934.) The true rate of climb at constant power depends upon density altitude and is therefore constant for a given density altitude. Likewise the true rate of descent depends upon density altitude and is so plotted. While at any density altitude the time to climb through an increment of true (geometrical) altitude is constant for the cruising (constant-power) climb, the time required to climb through a given increment of pressure or density altitude is proportional to the ratio of the existing absolute temperature to standard $\frac{T}{T_s}$. The time required to climb between true altitude limits (which are indicated limits only for standard temperature) is

$$t_c = \int_{h_1}^{h_2} \frac{dh}{\frac{dh}{dt}} \tag{11}$$

where h is the true (geometrical) altitude. When air density is decreased because of high air temperature the distance between two density (or pressure) altitudes is increased, so that the time required to climb between two density altitudes becomes

$$t = \int_{h_{d_1}}^{h_{d_2}} \frac{T}{T_s}\,\frac{dh_d}{\frac{dh}{dt}} = \frac{T}{T_s}\,t_s \tag{12}$$

where $\frac{T}{T_s}$ is approximately constant.

The time between two density (or pressure) altitudes varies directly as the temperature ratio $\frac{T}{T_s}$ when the true rate of climb is constant, as obtained with constant power.

Since the airplane is regulated in cruising flight according to density altitude, the time to and from a certain density altitude will vary with temperature. This is somewhat unfortunate because all other important cruising characteristics can be plotted directly against density altitude. The time to climb and descend from altitude for the recommended climb and descent have been calculated and plotted against density altitude in Fig. 39 in which is also included the corresponding velocities of flight at each altitude. The effect of temperature variation is illustrated by the three curves which have been plotted for standard temperature and 50 deg. F. above and below standard.

The distance (d in miles) traversed while climbing to and descending from each altitude is derived from the integration of the velocity times the time through the increment of altitude.

$$d = \int_{h_{d_1}}^{h_{d_2}} \frac{T}{T_s}\,\frac{V}{60}\,\frac{dh_d}{\frac{dh}{dt}} = \frac{T}{T_s}\int_{h_{d_1}}^{h_{d_2}} \frac{V}{60}\,\frac{dh_d}{\frac{dh}{dt}} \tag{13}$$

where V is in m.p.h. and $\frac{dh}{dt}$ is in feet per minute. These distances for the recommended type of cruising operation are plotted in Fig. 40. The results are plotted against density altitude and again show the effect of temperature variation from standard. The distance in the descent has been plotted for 50 per cent and 75 per cent power, which cover the probable cruising range of operation. The distance in climb is plotted only for 75 per cent power and represents the low-pitch climb that has been recommended.

The net increase in time resulting from the climb to and descent from a given cruising altitude over the time required if the distance traversed were flown in normal level flight at the given altitude is shown in Fig. 41. The greater loss in time for the case of 75 per cent power than for 50 per cent power is caused largely by the fact that the 75 per cent power climb, which is assumed for all flights, is relatively more favorable where the remainder of the flight is carried out at lower power output. Much of the time sacrificed in climbing is regained in the descent, so that the total increase in time for the flight is not extremely large. The variation in time with change in temperature is reduced accordingly. It is believed that, within the probable accuracy of cruising operation, the net increase in time caused by the climb and descent can be assumed to be independent of the temperature variation, and therefore considered to depend directly on density altitude alone. The pilot should note, however, that the cruising glide should be started earlier with higher temperatures as shown in Fig 40. Although the time is largely compensating, the differences in distance remain.

The velocity and time required for several lengths of trips at various altitudes are now determined by adding the net increase in time from climbing to and gliding from the cruising altitude to the time normally required for the distance in level cruising flight. The overall cruising velocity for trips of 200, 500, and 1,000 miles have been calculated for 50 per cent and 75 per cent power cruising condition to illus-

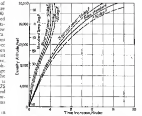


Fig 41: Net increase in trip time resulting from the 75 per cent power low-pitch climb to and the 400 ft. per minute power descent from the level flight cruising altitude. The change due to temperature variation from standard is shown. This increase in time is in addition to the time which would be required in level flight for the distance traversed in the climb and descent

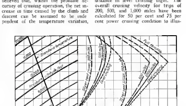


Fig 42: Overall velocity for various lengths of trip plotted versus density altitude for 75 per cent and 50 per cent. The curves assume that the take-off and landing are made at sea level, and that 75 per cent power low-pitch climb and the descent at the given power are used (Douglas Transport DC-2)

trate the effect of trip length and climb and glide on the net trip velocity The results are plotted in Fig 42, on which, for comparison, the level flight cruising velocities for these same percentages of rated engine power are also plotted

A study of these curves reveals that the best altitude for cruising flight increases with the trip-length as is generally known. For trips above approximately 300-mile best overall cruising speed is obtained by flying at the highest altitude for 75 per cent power, or 14,000 ft. on the airplane for which these data were obtained Approximately 9,000 ft is the best altitude for a 200 mile trip For shorter trips the best altitude rapidly decreases down to the altitude at which the manifold pressure limit reduces the velocity If the airplane is cruised below this altitude, (here 4,000 ft), a rapid decrease in velocity results even for quite short trips. For flight at 50 per cent power, the best altitude decreases less rapidly with decreasing distance as reference to Fig 42 shows For long trips the average total velocity is only slightly less than the actual velocity in the level portion of the flight, but the loss rapidly increases with decreasing length of trip and increasing altitude The particular variation of "trip" velocity with altitude of course will be different for each type of airplane under consideration

In order to facilitate the construction of cruising charts for various trip lengths it is convenient to plot the curves with trip length as the ordinate The speeds for any trip length can be obtained conveniently from these curves in Fig 43 The limiting minimum values of distance which permit climb and glide to a given altitude are shown by the dotted lines The envelope or optimum curve is shown by the dashed lines. The points from these optimum lines are plotted in Fig 44, and show the best altitude for various trip lengths. It is interesting to note that the full-throttle power limit is the limiting altitude for the longer trips at 75 per cent power Greater trip velocity could be achieved if it were possible to maintain the power to higher altitudes.

The corrections that have been made in the level cruising velocity for the climb to and glide from altitude have assumed the take off and landing at sea level fields. Since the fields at each end of a scheduled trip are often at altitudes other than sea level, additional correction must be made The effect on the overall "trip" velocity of take-offs and landings at altitudes other than sea level is quite appreciable, hence this adjustment should be made if good accuracy is needed It is particularly desirable that airlines whose routes include landing fields at various altitudes have knowledge of the effect of altitude take-offs and landings on trip time so that their schedules can be planned accordingly The pilots should note that the distance in the climb and glide will be modified, hence the flight path must be altered accordingly

The corrections to the trip time when take off and landing are made at altitudes above sea level are shown in Fig 45 The correction to the elapsed time depends on (1) the altitude of take-off, (2) the altitude of landing, (3) cruising power Within normally acceptable limits of accuracy it can be assumed that the time increment is independent of (1) trip length, (2) altitude of level cruising, (3) atmospheric temperature The gain resulting from take-off at altitude is considerably greater than the loss resulting from landing at altitude, especially in the case of cruising at 75 per cent power.

The effect of take-off and landing altitude on the average "trip" velocity is illustrated in Fig 46 The velocity increment depends on trip length, while the time increment is independent of trip length The velocity change decreases with increasing trip length. For a 1,000-mile trip the decrease in velocity becomes almost negligible for landing at altitude, and the increase in velocity is relatively small for take-off at altitude. For a 200-mile trip at 75 per cent cruising power, however, the gain in average velocity is 16 m p h for a take-off at 10,000 ft , while the loss in velocity from landing at 10,000 ft. is only about 1 m p h.

The average velocity, or net time, for any trip from one landing field to another is now determined by correcting the velocity obtained from Fig. 42 or 43 (which assume sea level take-off and landing) for the effects of the take-off and landing at altitude as given in Figs 45 and 46 Cruising velocity charts thus obtained for certain scheduled portions of an airline will be given in a succeeding article

The manner of making the climb and descent, and the altitudes from which the take-off and landing are made have been studied and the resulting effects or trip velocity determined Certain variations will of course occur for any application, but the general method and results will be similar to those here illustrated

The character of the winds aloft will have a marked effect upon the cruising velocity and scheduled time. The pilot and airline ground personnel need information and methods of controlling the cruising operation which will enable them to maintain definite schedules under all conditions The problems involved in the maintenance of scheduled trip time, and its relation to piloting control in the cruising flight will be treated also in a succeeding article.

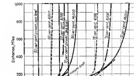


Fig 42: Average trip velocity as a function of trip length for various density altitudes when take-off and landing are made at sea level. The envelope curve for the most favorable altitude and the minimum condition for climb and descent only are shown. 75 per cent power, low-pitch climb and 400 ft per minute power descent are assumed.

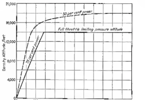


Fig 44: Curves showing cruising altitude for minimum trip time 75 per cent power, low-pitch climb and 400 ft per minute power descent are assumed. Full throttle limits the best altitude for long trips at 75 per cent power.

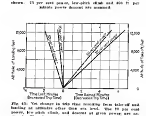


Fig 45: Net change in trip time resulting from take-off and landing at altitudes other than sea level. The 75 per cent power, low pitch climb, and descent at given power are assumed. The given power is maintained in the level portion of the flight.

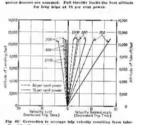


Fig 46: Correction to average trip velocity resulting from take-off and landing at fields above sea level The 75 per cent power, low-pitch climb and descent at given power are assumed. The level portion of the flight is carried out at the given power.

Overhaul Hollandaise

Notes on a few K L M. maintenance methods as disclosed by a series of photographs of the Amsterdam and Rottardam shops furnished through the courtesy of Albert Plesman.

COMPARISONS with airline methods abroad are always interesting, and we are fortunate in having access to material describing certain K.L M maintenance operations and equipment which have been developed in the shops in the Netherlands American readers will be interested not only in the fact that the engine which is being installed is a Pratt & Whitney Hornet, but also in the construction of the servicing platform, and its accessories. The framework is of riveted steel angle iron, and the broad, flat top is surfaced in wood Large cast iron wheels permit ready portability Note particularly the drip pan and the metal tire guard over the wheel to keep oil and grease out of contact with the rubber An overhead electric crane offers a convenient means for handling the engines and other heavy parts

Other mechanical gadgets in the Amsterdam shops would make American maintenance men feel quite at home For example, the rubber-tired dollies used to handle engines on the shop floor or from hangar to overhaul are like those to be seen at Kansas City or Cheyenne Engine run-in stands and controls, although operated in an open-ended shed without benefit of elaborate ventilating stacks or air passages, are similar in most respects to installations in this country The propeller shop also has a decidedly familiar air about it Most striking variation a combined balancing and pitch checking stand consists of a wall-mounted horizontal spindle on which propellers are placed in a vertical plane on a special non-friction bearing Balance, track and pitch adjustments can thus be made without changing the set-up after it has once been properly mounted on its spindle Two and three-bladed propellers in stock are mounted over short tubular metal spindles fastened along a wall at a convenient height

E D I T O R I A L S

AVIATION

A House Divided

THE American aviation industry has attained an enviable place in the esteem of nations. Through depression years, against the handicaps of deflated markets, governmental economy, and uncertainties of federal policies it has struggled along an uphill road to the position where its products are in daily use in every corner of the world. By a delicate balance between internal cooperation and competition, and the preservation and effective utilization of engineering skill the industry has out-distanced its international competitors and is now in undisputed leadership in many phases of its activity. The results of the MacRobertson race and the flight of Kingsford-Smith are the most recent testimonials to this leadership.

Results of this remarkable progress are reflected in the export figures which in 1933, showed business volume comparing favorably with that of 1929. Export orders have saved more than one manufacturer from closing down his plant and being forced to scatter his skilled workers and trained engineering staff to the four winds. More than one necessary unit in the productive capacity of an industry that would be invaluable in a national emergency has been able to keep going through the lean years by developing devices that attracted purchasers in other countries.

By sheer merit and largely by its own bootstraps the industry has lifted itself to its present position of superiority. Foreign trade has been a stabilizing factor of inestimable value in preventing the dissolution of the industry while the government was not in a position to give the required measure of financial assistance.

And now comes a calamity that threatens to erase a large part of this hard-earned progress and divert to our competitors in the manufacture of aeronautic goods at least a substantial portion of our export business, a devastating prospect for an industry which has so successfully worked out its own salvation and depended so heavily on export business for its existence in the last few years. The cloud on the horizon is the senatorial investigation now being conducted by Senator Nye.

The progress of aeronautic exports has not stopped. Contracts have not been cancelled on a wholesale basis. It is difficult but not altogether impossible to restrain the wheels of progress and the recognition of merit. But serious difficulties have been placed in the industry's path. Deliveries and acceptances have been slowed up. Purchasing officials in other governments have feared that their methods of doing business might be misinterpreted and have hesitated to place orders. A serious handicap has been introduced in the development of a brilliant export market.

We are in full sympathy with the worthy aims of the committee under Senator Nye's direction. We would go so far as to say that if international peace could be attained by the simple process of turning over our export business to our national competitors, we would be inclined to fall into the ranks of Senator Nye's unqualified followers. In the long run there is much more to be gained for the industry as a whole by orderly peace time development than from the temporary stimulus and devastating aftermath of war. But it is difficult to understand how the sacrifice of our hard-earned export business would make any substantial contribution to world peace. Even if it were possible to make a sharp distinction between commercial and military designs and restrict the sale of those branded military there would be a representative of some other country's aviation industry waiting on the manufacturer's doorstep for the business turned away. And our industry would be faced with further contraction or the necessity of charging higher prices for government business. A flight of manufacturing facilities to foreign soil might easily ensue with all the unhappy consequences to labor and the domestic materials market.

Aside from the presumed desirability to the government of maintaining an adequate private aviation industry, there is an important strategic advantage in the event of international emergency, for the nation representing the chief source of supply of the enemy. Military secrets do not long remain unknown to those whose business it is to ferret them out and once a ship or engine is constructed its features soon become the common property of all the world and, if the manufacturer can afford an alert research organization, a much improved design is already on the drafting boards. Since engineering ability is international and no nation can claim supremacy in technical skill it is only by continuous effort that leadership can be maintained in the design of products which are frequently obsolete before they are completely constructed.

There is nothing we as a nation can do to prevent the purchase of airplanes by foreign countries. They are going to have them at any cost and, if we do not

furnish them, the prospective purchasers will buy from someone else or make their own. Neither of these two courses would seem to be desirable.

The Senate committee has set about to perform a difficult task and one that has been tried before without success. It would appear to be more properly a matter for international agreement than for national initiative.

Within a few days after this appears the Nye committee will have resumed its hearings. Their progress will be observed with interest. We sincerely hope that the committee members will renew their zealous efforts with the realization that there is keen rivalry between nations for aviation export business and that it is an injustice to our manufacturers to place them at a disadvantage in their competition with aeronautical equipment makers of other nations.

More Records

FOR MANY MONTHS we have been urging editorially the logic of competing for world records to establish clearly and beyond all question of doubt the position of American designs and products in the world aeronautical picture. No empty chauvanism has prompted these urgings, but rather a feeling that American manufacturers could thereby open up world markets that have hitherto been closed to them by foreign competition of long standing. The Sikorsky S-42 started the ball rolling last summer by bringing back to this country ten F A I records for load carrying and speed for flying boats. Considerably more dramatic, but equally gratifying was the splendid showing made by American airplanes, engines, and instruments in the recent race for the MacRobertson trophy, and in Kingsford-Smith's Pacific crossing.

Scott and Black, in winning the race to Australia put up a marvelous show. For sheer stamina and courage their flight is probably without equal in aviation history. Our feeling of pride in the achievement of our own men and machines does not detract one whit from the warmth of the congratulations which we extend to them. But even the British concede that the real significance of the race lies in the performance of the Douglas and the Boeing, second and third ships to reach Melbourne. That two stock transports, similar in all but minor respects (mainly tankage) to machines which fly daily on our scheduled air services, could show such performance over a distance almost half-way around the world, is nothing short of remarkable. That the second arrival (later adjudged winner of the handicap race), carried an appreciable payload, and made all regular KLM stops is really astounding.

Whether these ships were built in Seattle, Los Angeles or Timbuctoo is, broadly speaking, beside the point. The fact that regular transport airplanes are now able to compete on equal terms with special racing machines over the most difficult course ever laid out, is a striking indication of design progress. That the ships *were* built in Los Angeles and Seattle, and *not* in Timbuctoo is, in particular, very much to the point. Every manufacturer who had anything to do with the American entries may legitimately mingle a feeling of hope with his natural feeling of pride,—hope that it will be possible in the future to compete in foreign markets on a more equal basis with foreign producers.

Other races are in prospect. The French are already discussing a course from Paris to Indo-China. The British are making plans for a race next year to South Africa. Perhaps it is not out of order to suggest an American-sponsored race over some of the international routes of the Western Hemisphere. Many F A I records are still quite unnecessarily held abroad. Again we urge that the American industry avail itself of every opportunity to add to its laurels. All such spectacular achievements serve to pave the way toward a wider recognition of the merits of American aeronautical equipment and make it easier to sell it in world markets.

Get the Facts

THE OBVIOUS ANTIDOTE for rumor is a plain statement of fact. One of the prime reasons why rumor concerning the structural integrity of certain airplanes has attained such ridiculous and alarming proportions has been the absence of any statement from authoritative sources giving the true circumstances surrounding the few accidents in which they have been involved. Neither by fair means nor foul has the public nor the industry at large had access to authentic information, and the general inclination has been to accept material published by the interested parties with more than a grain of salt.

Fortunately, machinery has been put in motion to insure full accessibility to facts concerning aircraft accidents. Under an amendment to the Air Commerce Act of 1926, passed by the last Congress, the Secretary of Commerce has been authorized to investigate and to make public the circumstances surrounding major and fatal civil aircraft accidents. First tangible results have appeared in the form of a complete report by the Director of Air Commerce, covering the loss of a transport plane in the Mid-West. The report made public in a little over two weeks from the date of the accident a complete statement of the case as established by an impartial board of investigation. Not only were facts presented, but the probable causes were traced and responsibility allocated.

We look forward confidently to an ever increasing improvement in the safety record of American airlines, but, when accidents do occur, we are in full accord with the principle of making full account of the facts available to the industry and to the public. It is only through such means that the epidemics of vicious rumor that have followed in the wake of every serious transport accident in recent years can be avoided.

NEWS OF THE MONTH

★ FEDERAL AVIATION COMMISSION hears testimony from Chamber of Commerce representatives, lighter-than-air proponents, Army and Navy officials

★ SERVICES . . . Navy General Board recommends construction of dirigible.

★ AIR MAIL AND TRANSPORT . . . TWA moves to Floyd Bennett . . . Douglas makes record flights . . . Pan American Airways announces experimental Pacific flights

★ MISCELLANEOUS . . . Kingsford-Smith re-crosses Pacific . . . Final MacRobertson Race results announced . . . Army's Mitchell Trophy Race resumed.

★ FOREIGN . . . France completes her first full scale wind tunnel

Air board hearings

AS the Federal Aviation Commission began its second month of hearings, representatives from the Chambers of Commerce of a number of West Coast and Mid-Western cities appeared before it to urge revision of the Air Mail Law Specifically, they sought an amendment which would permit United Air Lines to continue operation of its coastal route from San Diego to Seattle in addition to its transcontinental route, an arrangement impossible under the present law after March 1, 1935

The Pacific Coast representatives went on to recommend government construction of dirigibles for commercial service to the Orient, asserting that development of lighter-than-air routes would be a motivating factor in trade development, stimulating greatly the prosperity of West Coast cities

The case for the airship was further presented by Dr. Hugo Eckener Emphasizing the practicability of commercial trans-oceanic lighter-than air service, Dr. Eckener cited the record of the Graf Zeppelin which in six years has completed 415 trips over a total distance of more than 600 000 miles, including 64 South Atlantic, seven North Atlantic, and one Pacific crossing. A German-American-Dutch operating company, Dr Eckener said, was seriously discussing a trans-oceanic service that would include two lines, one from Friedrichshafen to South America and the other from the United States to Batavia, Java.

Speaking for the American airship industry, Paul W. Litchfield, president of the Goodyear-Zeppelin Corporation submitted a seven-point program including government contracts for construction of dirigibles, allocation of ships to commercial services adequate supply of helium, sufficient terminals and trained personnel

Ewing Y Mitchell Assistant Secretary of Commerce, said that as a result of studies undertaken by the Interdepartmental Advisory Committee for Aeronautics, the Commerce Department, and the National Advisory Committee for Aeronautics, a $17 000 000 program for commercial airship development was ready for submission to Congress The program provides for construction of two large ships for trans-oceanic service, a smaller metal-clad type for South American service, a terminal in the Eastern United States, and the examination of other proposed types of airships.

Rear-Adm. E J. King, chief of the Bureau of Aeronautics, went on record in favor of continued government development of airships both for military and commercial use Construction of at least one airship hangar on each coast with mooring masts at intermediate points was urged as an important measure of national defense by Brig Gen. O Westover, assistant chief of the Army Air Corps. Although convinced that lighter-than-air craft can serve a useful military purpose, General Westover said that priority should be given to construction of heavier-than-air because of limited army appropriations

Other advocates of a definite government program of airship construction were Rear-Adm. H I. Cone, U S N, retired, chairman of the advisory committee of the U. S. Shipping Board, E. P Farley, former chairman of the U S Shipping Board, William F Gibbs, of Gibbs & Cox, naval engineering firm, Roland B Respess, president of the Respess Aeronautical Engineering Corporation of Rhode Island, Lt-Comdr C E. Rosendahl, commanding officer of the Naval Air Station at Lakehurst, Carl B Fritsche, president of the Metal Clad Airship Corporation of Detroit, Senator Robert J Bulkley of Ohio, James T. Howington, vice-president of the Helium Company of Louisville.

Testimony of officials of the War and Navy Departments relating to national defense was heard in closed session and only its general trend was made public Gen Charles E Kilbourne after a summary of the War Department policies as presented in a brief by the Secretary of War, gave the General Staff view of the utilization of the new GHQ Air Force A list of the appropriations for military planes since the passage of the Procurement Act of 1926 was submitted by Col. Irving J. Phillipson. General Westover stressed the importance of the airways for peace-time training and war-time operations, and indicated the desirability of further development in certain strategic areas. He stated that he did not believe in a coordinated air service, considered that each service needed specially trained personnel Maj-Gen B D Foulois stated that as chief of Air Corps his first concern was to get proper and sufficient equipment, his next concern was trained personnel of all classes, and that organization, whether separate under the Army or the Navy or an independent force, was a secondary consideration Assistant Secretary of War Woodring and General Pratt of the Air Corps were heard on the subject of procurement.

The Navy's need for additional shore bases for patrol planes was stressed by Secretary of the Navy Swanson and Representative Carl Vinson, chairman of the House Committee on Naval Affairs. Both came out strongly against the establishment of a department of national defense. Rear-Adm Joseph K Taussig, acting chief of naval operations, and Rear-Adm Ernest J. King, chief of the Bureau of Aeronautics took the same stand on the latter point. Mr Swanson and Mr. Vinson did not agree, however, on the lighter than-air question Mr Vinson urged the construction of two additional naval dirigibles while Mr Swanson was of the opinion that their usefulness to national defense was not yet proven Stating that the procurement of aviation equipment had been satisfactory under the Procurement Act of 1926 until last spring when the Comptroller General made a new ruling, Mr Swanson recommended clarification of the wording of the law Other naval officials urged removal of restrictions upon aircraft procurement and an increase in officer personnel by enlarging the enrollment of the Naval Academy and by the assignment of reserve aviators to active duty

Among other witnesses were Representative Mark Wilcox of Florida, who presented a comprehensive program for air defense; Representative Ross A. Collins of the Military Appropriations Committee; E. R. Armstrong, head of the Seadrome Ocean Dock Corporation; Thomas A Morgan president of the Aeronautical Chamber of Commerce

Notification of the formation of a Joint Aviation Coordinating Committee for the purpose of promoting the interests of civil aviation in the United States was sent to the Commission Nov. 9 Composed of eight members the new committee will be made up of representatives of the four sponsoring groups including the Aeronautical Chamber of Commerce, the Independent Aviation Operators of the U. S, the National Aeronautic Association, and the National Association of State Aviation Officials Officials of the four organizations joined in a new recommendation for the establishment of a permanent commission for aeronautics.

Up, ship!

While general plans for renewed airship activity were laid before the Howell Board definite steps toward a trans-Atlantic service were taken as the Navy Department granted authority for Dr Eckener to use the airship landing stations at Lakehurst and Miami next summer With the new Zeppelin LZ-129 now nearing completion in Germany Dr Eckener will start an experimental service between Europe and the United States All expenses incidental to this arrangement will be borne by the Luftschiffbau Zeppelin Company After a series of demonstration flights across the North Atlantic the LZ 129 will join the Graf Zeppelin on the Germany-South American run

Construction of a 2,500,000-cu ft dirigible for training purposes to cost

Calendar

Dec. 18—Aeronautical Meeting of the Metropolitan Section S A E New York City

Dec. 17—National Aviation Day Thirty-first anniversary of first Wright flight.

Jan 8-10—Semi-Annual Meeting of the Operations Committee of the Aero Chamber, Miami Fla.

Jan 10—Opening of Seventh Annual All-American Air Races, Miami Fla.

Jan. 15-16—Aircraft and Aircraft Engine Sessions of the Annual S A E Convention Detroit, Mich

Jan 28-30—Annual Meeting of the Institute of the Aeronautical Sciences New York City

Jan 31—Annual Meeting of the Aeronautical Chamber of Commerce of America Washington, D C.

Feb. 1—Meeting of the Manufacturer's Aircraft Association, New York City

CLIPPER NUMBER 7

First of the Martin built clipper ships for Pan American's fleet is nearing the flight-test stage at Baltimore It is the largest plane ever turned out in this country being designed to carry 50 passengers a crew of six and 2 tons of mail and express on present service routes Four fourteen-cylinder Pratt and Whitney engines furnish the power

about $3,000,000 has been recommended to Secretary Swanson by the Navy's General Board. The board indicated, however, that it was not ready to advocate the construction of larger airships. Its recommendation for a training ship is in line with the report of the Congressional Joint Committee, headed by Senator King of Utah, which in 1933 investigated the Akron disaster and proposed that a training ship be built at once to be followed by a larger one to replace the Akron.

Floyd Bennett looks ahead

Official announcement that TWA will shift its Eastern operating base within the next few weeks from Newark airport to Floyd Bennett Field, New York City's municipal airport in Brooklyn, was made Nov. 17. To take care of the airline's needs, the city is carrying out many improvements. These include heating and shop facilities for the hangars, two additional runways, traffic control lighting and remote control radio facilities, a marker beacon and approach and runway lights, a completely equipped weather station, and sleeping accommodations and a restaurant for passengers.

Since Newark is New York's official air mail terminal TWA will be obliged to transfer mail arriving at Floyd Bennett to the post office in Newark, using tri-motored Fords. However, the city administration with the cooperation of Representative Thomas H Cullen of New York, plans to make recommendations to the Post Office Department that Floyd Bennett be designated as an official mail terminus. Arguing the reasonableness of this view, Mayor La Guardia pointed out that 95 per cent of all mail arriving in Newark was addressed to New York and that it would be possible to deliver mail to the Brooklyn Post Office within 15-18 minutes after its arrival at Floyd Bennett. It would then be dispatched to its final destination in eight minutes by the pneumatic tubes used to convey mail from Brooklyn to Manhattan post offices.

Though for the next few months TWA will transport passengers to and from the airport by automobile, plans are under way for a seaplane shuttle service which would shorten the 45-minute trip to six or seven minutes. Ford planes on floats will take passengers from the seaplane ramps at the foot of Wall Street and the foot of 31st Street on the East River to another seaplane base now being constructed at Rockaway Inlet directly across from Floyd Bennett. A passenger bridge from the base to the field is also being considered.

Meanwhile, the city of Newark announced that the FERA had approved a grant up to $100,000 to complete the administration building. A moratorium on rental payments until next year as well as a reduction on field charges has been declared. Plans for a seaplane base at Port of Newark within five minutes by automobile from the airport are now ready and construction will be completed within the next few months.

Alarmed at the rumored removal of the air mail Post Office from Newark to Floyd Bennett, Governor Moore of New Jersey and Mayor Ellenstein of Newark filed vigorous protest with President Roosevelt, Postmaster-General Farley and interested Congressmen. They stated that Newark had expended more than $5,000,000 on its airport with the understanding that mail service would be maintained there, and was entitled to a return on its investment. They pointed out that removal of the terminal to Floyd Bennett would mean additional expense to the government since the Brooklyn airport is 15 miles further from the West Coast than is Newark and mail contractors would have to be paid accordingly.

New Douglas records

Flying from Los Angeles to Newark in 12 hours, 3 minutes, 15 seconds, a Douglas DC-2 belonging to Eastern Air Lines established a transcontinental record for transport planes Nov. 8. In charge of the flight was Capt. Edward V. Rickenbacker, vice president of North American Aviation. On board also were Silas A. Morehouse, chief pilot of TWA, Capt Charles W. France, vice-president in charge of operations for Eastern Air, and three newspaper men. Loaded with 670 gal of gasoline, the plane took off from Union airport Thursday morning at 8:43 E.S.T., made a twelve-minute refueling stop at Kansas City, and reached Newark airport at 6:15 that evening. During most of the flight the ship was cruised at an altitude of 12,000 to 17,000 ft., maintained an average speed of 216.3 m.p.h. The previous record of 13 hours, 4 minutes for the 2,609-mile West-to-East trip was made last February in a Douglas by Captain Rickenbacker and Jack Frye, general manager of TWA.

A few days later the same Douglas broke existing records for transport planes between New York and Miami by making the round trip of 2,400 miles in 14 hours, 55 minutes flying time. Though head winds, sleet and snow squalls cut down speed the plane made the southbound trip in 7 hours, 54 minutes, the northbound in 7 hours, 1 minute. Total elapsed time including refueling stops at Washington and Jacksonville was 17 hours, 17 minutes. A capacity load of fourteen passengers in addition to two pilots was carried. The speed record between New York and Miami is still held by the late James Wedell who flew the southbound route in his Wedell Williams Special in 5 hours 1 minute, 39 seconds in November, 1933. The Douglas flight directed by Captain Rickenbacker marked the opening of Eastern Air Lines' new eight-hour schedule between New York and Miami which became effective Nov 19. The company's fleet of nine new Douglas transports will fly two round trips daily on a limited-stop basis. Later, Douglas schedules will be inaugurated on Eastern Air's New York-New Orleans and Chicago Miami runs on an 8½-hour schedule.

A FRENCH BID FOR ATLANTIC SERVICE
Giant Latécoère flying boat, designed to compete with other air services on south-Atlantic trade routes, nears completion at Toulouse. Of interest is the double-deck cabin arrangement. Powered with six water-cooled Hispano engines of close to 1,202 hp. each the ship is expected to cruise at approximately 140 m.p.h. with an all up weight of 32 tons.

LADY SOUTHERN CROSS
The Wasp-powered Lockheed Altair in which Sir Charles Kingsford-Smith made his eastward Pacific crossing by the Fiji Hawaiian route.

Another link was added to American Airlines' system Oct 22 when passenger service between Newark, Philadelphia, and Washington was inaugurated. Previously only mail and express had been carried over this route. Fifteen passenger Condors cruising at 160 m.p.h are used on the new run which completes the Southern Transcontinental route by providing direct service from Washington to Cincinnati where connections are made for the Southwest and the Pacific Coast.

Delivery of additional Lockheed Electras has enabled Northwest Airlines to extend all the way to Seattle its new high speed service, heretofore operated only between Chicago and the Twin Cities. The schedules are laid out for a total elapsed time of 14½ hours westbound and 15½ eastbound. The work of lighting and equipping the Northern Transcontinental Airway for which the Bureau of Air Commerce is spending $655,000 progresses rapidly and night flying will soon be possible over the entire route.

United Air Lines in November again speeded up schedules from New York and Chicago to Los Angeles, reducing stops to six and increasing speed between certain points. These changes plus the time saved by the use of General Air Lines' new Douglases between Salt Lake City and Los Angeles have reduced eastbound schedules 2½ hours, westbound, 2 hours. By improving connections with Pennsylvania Air Lines at Cleveland, United now has speedier service from California to Pittsburgh and Washington, making the trip from Chicago to Washington in 5 hours, 5 minutes. The company has resumed operations out of South Bend, Ind., and provides overnight service to the West Coast and three-hour service to New York. Ten Boeing-247 D's were recently delivered to United and the work of converting other Boeings into geared types will begin shortly. Normal cruising speed of the new planes is 189 m.p.h at 12,000 ft.

Pacific paragraphs

An experimental air mail flight from California to China by way of Honolulu and Manila is projected by Pan American Airways for some time during the winter with the second of the S-42 series recently completed at the Sikorsky plant in Bridgeport, Conn.

Meanwhile, Stanley C. Kennedy, president of Inter-Island Airways in Hawaii, who is also actively interested in beginning a service between California and Honolulu, has issued a joint statement with Juan T. Trippe president of Pan American Airways, to the effect that the objectives of the two companies differ sufficiently to render them non competitive.

Prevented by delays in his preparations from competing in the MacRobertson Race, Sir Charles Kingsford-Smith took off from Brisbane, Australia, for California 1½ hours after the first MacRobertson entry left Mildenhall Oct 20. With him as navigator for the 7,300 mile flight to the other side of the Pacific was Captain P. G. Taylor. Their plane, "Lady Southern Cross," was a Lockheed Altair, powered with a Pratt & Whitney supercharged Wasp, of 550 hp. First port of call on their itinerary was Suva in the Fiji Islands, 1,750 miles from Brisbane. They arrived at 1:05 a.m. Oct. 21, after a flight of 11 hours 45 minutes. Held there for a week by storms, the flyers took off Oct 28 at 1:05 p.m. for Hawaii, 3,500 miles distant. Next day at 2:10 p.m. they landed at Wheeler Field, Honolulu. Delayed once more because of unfavorable weather, they did not set out on the third and last leg of their flight until Nov 3 at 7:45 p.m. They had 2,408 miles to go before reaching their final destination. Aided by brisk tail winds, they reached Oakland in fifteen hours, apologized for being two hours ahead of time. Total flying time for the entire trip was 51 hours, 49 minutes.

MacRobertson finalities

The results of the handicap race, the division of the prize money and a summary of reported times has been compiled from cable reports and printed in the British magazine, *Flight*. Though lacking official confirmation by the Royal Aero Club, they are the probable last word on the immediate results of the MacRobertson contest.

Of prime interest is the fact that Scott and Black are revealed as winners of the handicap as well as the speed race, the forced unloading of the

MACROBERTSON RESULTS

Speed Race	Total Time hours	minutes	seconds	Speed m.p.h
1 Scott and Black (D.H. "Comet")	70	54	18	159
2 Parmentier and Moll (Douglas D.C.2)	90	13	36	125
3 Turner and Pangborn (Boeing 247 D)	92	55	38	121.5
4 Jones and Waller (D.H. "Comet")	108	13	45	104
5 Hewett and Kay (D.H. "Dragon Six")	552	51	12	54

Handicap Race	Net Time hours	minutes	seconds	Flying Time hours	minutes	seconds	Speed m.h.p.
1 Scott and Black (D.H. "Comet")	64	48	49	65	24	13	190
2 Parmentier and Moll (Douglas D.C.2)	76	38	12	71	22	0	173
3 Melrose (D.H. "Puss Moth")	79	17	50	120	16	2	103
4 Stodart and Stodart (Airspeed "Courier")	79	52	32	102	24	06	125
5 McGregor and Walker (Miles "Hawk Major")	82	43	34	113	5	46	105
6 Hewett and Kay (D.H. "Dragon Six")	85	42	28	136	51	28	116
7 Hansen (Desoutter)	87	45	21	129	47	45	95

Douglas a few hundred miles from the finish reflecting severely on its allowed handicap Permitted to collect a prize in but one race, Scott and Black, of course, elected to receive the £10 000 award for first place in the speed event Parmentier and Moll then elected first place in the handicap and its £2,000, leaving the second place speed prize of £1 500 for Turner and Pangborn Others in the money were Cathcart Jones and Waller who received £500 for third place in the speed race and C. J Melrose, whose second in the handicap drew £1,000 All of the nine contestants to finish within the specified nineteen days will be awarded special gold medals in appreciation of their achievement

Air mail hearing

The petition of Bowen Airlines to have the air mail contract of Long & Harmon cancelled was dismissed after a public hearing Oct 25 by the Post Office Department which claimed that the point raised was not within its jurisdiction Bowen Airlines charged that Long & Harmon, operators of the Amarillo-Brownsville, Texas, route, had been carrying passengers at an unreasonably low rate in violation of the Air Transport Code. The Department has not yet reached a decision on the Air Line Pilots Association protest, charging Long & Harmon with failure to pay the National Labor Board's wage scale.

Wind-tunnels

The first full-scale wind-tunnel to be built in France was completed early in October It is located at Chalais-Meudon, a few miles from Paris Of non-circulating type, it is constructed of reinforced concrete The entrance throat to the test chamber is of elliptical shape and has a dimension of 16 meters (52½ ft.) across its major axis There are six ten bladed propellers 8½ meters (46 5 ft.) in diameter, each driven by an electric motor of 1,000 (metric) horsepower The air speed in the test chamber is 180 km p h (112 m p h)

X-13198

A dramatic demonstration of the ability of the new Pitcairn wingless autogiro to land and take off in congested areas was carried out recently in New York City by James G Ray, vice-president of the Autogiro Company of America and co-developer with Harold F Pitcairn of the new machine (See page 408 for technical details) Flying in from Floyd Bennett airport Mr Ray used the end of Pier 9, East River, adjacent to the Wall Street Skyport, as a landing field Previously, Mr Ray had put the autogiro through its paces in Washington before a group of government officials

New Army records

The Mitchell Trophy Race, flown Nov. 17 at Selfridge Field, Mich., after a lapse of three years was won by Captain Fred Nelson, who averaged 216.8 m p h. over the four circuits of a 20-mile course Captain Nelson led a field of ten pilots from the First Pursuit Squadron, all of whom broke the record of 175.4 m p h set by Lieut. Cyrus Bettis in 1930, when the race last was flown All of the contestants used low wing Boeing pursuit planes, powered with supercharged Wasps

The Curtiss Trophy, offered for the first time this year, was won by Lieut. Thomas Gaughan, Jr, circling the 20-mile course three times at a speed of 191 4 m p h

Industry reports

According to statistics compiled by the Bureau of Air Commerce, 1,285 airplanes were manufactured in the United States during the first nine months of 1934, registering an overall gain of 21 per cent over the same period last year Of this number, 673 were for domestic civil use (up 22 per cent), 306 for the services (up 20 per cent), and 306 for export (up 18 per cent)

North American Aviation, Inc, and wholly owned subsidiaries reported a net loss of $744,846 in the first nine months of 1934 after deducting depreciation charges of $264,957 and before including a profit of $1,199,941 realized from the sale of securities Including the latter sum, the period shows a net profit of $455,095 This profit would be reduced to $300,452 if there were included in it North American's proportion of the net loss of subsidiaries not consolidated in which a majority stock interest is held A net loss of $355 859, after depreciation, was reported by the corporation for the same period last year

Consolidated net loss of Aviation Corporation and subsidiary companies for the nine-months' period ending September 30, 1934, was $1 711,757 This compares with a profit of $395,819 for the corresponding period in 1933 Mail revenue for the 1934 period amounted to $1,052,332, compared with $3,743,060 for the first nine months of 1933

Notification of conditional approval of a $1,500 000 loan from the Reconstruction Finance Corporation was received by the Glenn L Martin Company Nov. 2 Since one of the conditions was that the company obtain an extension of its 6 per cent notes due Nov. 1, 1934 until Nov 1, 1939, the company filed a bankruptcy plea under the National Bankruptcy Act Glenn Martin, president said that more than two-thirds of his company's creditors had agreed to the extension. A hearing was set for Nov. 21

United Aircraft Exports Corporation, a subsidiary of United Aircraft Corporation, was recently chartered in Delaware. With headquarters in East Hartford, Conn, the new company will take over the business and the assets of United Aircraft Exports, Incorporated

A production milestone has been reached by Stinson Aircraft Corporation which recently delivered its 600th four-passenger plane

A new export market for Security Airsters was opened with the appointment of R. Hesselberg-Meyer of Oslo, Norway, as exclusive sales agent in Scandinavian countries. As a sales demonstrator the new distributor has purchased a special Airster, equipped with a convertible landing gear for use with floats and skis as well as wheels

United urges exports control

In response to an invitation from Senator Nye to present the views of United Aircraft Corporation on the exportation of military equipment, President Donald L. Brown submitted to the investigating committee a program recommending government control of munitions exports elimination of war profits by taxation, and continuance of the development and manufacture of aircraft by private industry On the latter point, Mr. Brown expressed the opinion that experience had shown that governments cannot themselves design and manufacture equipment of the same quality as that produced by private enterprise He held that a policy of outright prohibition of export of aircraft would have very little influence on the promotion of international peace, but would simply transfer markets from American manufacturers to foreign competitors

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WALTER EUGENE THOMAS, 42, president of the Pacific Airmotive Corporation and experienced pilot, was killed Nov 17 when his plane crashed into a fog-obscured mountain about 20 miles from Los Angeles Mr Thomas first became an active pilot and plane owner in 1922 In 1926 he assisted in the organization of Pacific Airmotive Corporation with headquarters in Los Angeles, became its general manager and later its president. He had been active in the National Aeronautic Association for many years, having served as president of the Southern California chapter, and at the time of his death was a member of the advisory board He was also a member and past president of the Professional Pilots' Association

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Aviation People

• A new subsidiary to United Aircraft Corporation has been formed, to be known as United Aircraft Exports Corporation Its president will be CHARLES W DEEDS former vice-president of Pratt & Whitney Aircraft Company. J REED MILLER, secretary and treasurer of one-time United Aircraft Exports, Inc., and previously treasurer of Hamilton Standard Propeller Company, assumes the vice-presidency E B HAINES and STEPHEN A McCLELLAN, recruited from Pratt & Whitney Aircraft Company and United Aircraft Exports, Inc, respectively, have been made Assistants to the President. Mr Haines is to make his headquarters at East Hartford while Mr McClellan takes charge of the New York office at 230 Park Avenue.

• Lambert Aircraft Corporation of Robertson Mo, has announced the appointment of L. H COLLINS as sales representative for Texas, Oklahoma and Louisiana Mr Collins was formerly connected with the Aeronautical Corporation of America in similar capacity He covers his sales area in his Lambert 90 Monocoupe

• The Massachusetts Institute of Technology has announced the appointment of WILLIAM STARLING BURGESS, noted yacht designer, as special lecturer in the Department of Mechanical and Aeronautical Engineering Among the outstanding achievements in Mr. Burgess' record as a designer are many Cup defenders and his early seaplane designs for which he received the Collier prize in 1915 During the war Mr Burgess served in the aircraft design section of the Navy Department

• On Nov 4 Congress made belated recognition of EMORY BRONTE's achievement in navigating the first civilian plane to span the Pacific from California to Hawaii in 1927, by presenting him with the Distinguished Flying Cross ERNEST SMITH, pilot of the plane, received similar award five years ago

• C R. SMITH has been elected president of American Airlines, to succeed LESTER D SEYMOUR Mr Smith formerly vice-president in charge of the Southern Division, has been connected with the company for seven years

• United Air Lines has named WILLIAM CAMPBELL as field manager at Fresno, and has transferred HAROLD LEWIS, chief pilot of the western division, from Cheyenne to Oakland

• Aviation people who spoke at the 23d Annual Safety Congress of the National Safety Council, Cleveland, Ohio Oct. 3, were DAVID S INGALLS, DR. KARL ARNSTEIN, MAJ JAMES H. DOOLITTLE, FRANK A TICHENOR, and MAJ JOHN BERRY LESTER D SEYMOUR and CAPT E. V RICKENBACKER acted as chairman and vice chairman.

• JUAN T TRIPPE, of Pan American Airways, will head the Aeronautics Division of the Citizens Family Welfare Committee in its forthcoming $2,000,000 appeal to aid private home welfare agency activities. Associated with Mr Trippe in the solicitation of funds will be a group of leading representatives of the aviation industry

• N A A's Indianapolis chapter has as new president WALKER W WINSLOW, president of Indiana Aviation Corporation, who succeeds MAJ CHARLES E COX JR Other new officers are N H GILMAN, vice president, H O FISHER secretary, and R. SHANK, treasurer L R SCHWITZER was reappointed Indiana district governor and Major Cox became a director

• New officers selected at the Cheyenne convention (Sept 27-29) of the National Association of State Aviation Officials were FRED L. SMITH president, FRED B. SHERIFF, vice president; FRED D FAGG JR, secretary-treasurer GEORGE B LOGAN, legal counsel Regional vice-presidents CHARLES L. MORRIS, A. B McMULLEN, FLOYD E EVANS, JOHN D AKERMAN, E McDONALD, D R BRIMHALL, and ELLSWORTH FRENCH.

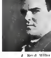
• SENATOR WILLIAM G McADOO, National Aeronautic Association's new president, has appointed ELLIOTT ROOSEVELT to act for him during his absence on an official visit of the Senate Committee to the Philippine Islands Mr Roosevelt's designation is "Temporary Assistant to the President."

• COL CLARENCE M YOUNG former Assistant Secretary of Commerce for Air, has become a member of the operating staff of Pan American Airways System He will be associated with the experimental flying boat service which the company plans to extend across the Pacific in the near future.

• LAST MAY, LIEUT CORNELIUS W COUSLAND was piloting a large Air Corps plane over the Canal Zone. A mechanical failure hurled part of one of the engines into the cockpit, killing the co-pilot and seriously injuring Lieutenant Cousland For his courage and skill in bringing the damaged craft to a successful landing, thus saving the lives of the remainder of the crew, Lieutenant Cousland was awarded the Distinguished Flying Cross by Congress on Oct. 27

• To General Aviation Manufacturing Company go LEE ATWOOD as chief engineer and S SMITHSON as design project engineer K. J BOSSART leaves General Aviation to become stress analyst at the Sikorsky Airplane Manufacturing Company.

Charles W Deeds



J Reed Miller

C R Smith

Walker W Winslow

Flying Services and Schools

• A crowd of 60,000 spectators attended the opening of the new municipal airport at Bloomington, Ill, on Oct 28. The ceremonies included an aerial parade, bomb-dropping and spot landing contests, altitude races and speed dashes, aerobatics, and glider exhibition flying. Many well-known pilots participated including Major James Doolittle, Harold Neuman, Arthur Davis, Roger Don Rae, and Charles F Abel, a total of 83 planes flying in for the meet.

Constructed as a CWA project under the supervision of the Illinois Bureau of Aeronautics, the airport is thoroughly up-to-date in all respects It comprises 164 acres and its macadam runways cover about 35,900 sq ft. At each end of the runways are circular "stationary turntables," 100 ft. in diameter. Regulation boundary, field, and obstruction lights have been installed and flood lights and flash beacons will be mounted soon. Hangar space is adequate for even the largest transports. The administration building provides business offices, waiting rooms, crew living quarters, and a restaurant

• Reporting a steady increase in sky advertising business, the Kellett Autogiro Corporation at Philadelphia has recently licensed eight new representatives. These include John Abuiso (Southern Pennsylvania), Liecon Airways, Inc (Eastern Florida), Bloomsburg Flying Club (Eastern-Central Pennsylvania), Soule Autogiro Sales Company (Northeastern Pennsylvania), Link Aeronautical Corporation (Cortland, N Y), Eckel's Air Service, Inc (Washington, N J), Ehlinger & Higgs, Inc (Oklahoma), Aviation Associates, Inc (Eastern-Central Missouri and Western Central Illinois) Licensees have also been appointed in several Latin American countries, including Brazil, Argentine, Paraguay, Uraguay, Cuba and Porto Rico.

• The ban on private flying over the Canal Zone, has now been lifted through the efforts of the Canal Zone Aeronautic Association Members of the association may own and operate planes over the 10-mile wide strip of U.S. Government controlled land, with certain restrictions necessary for the safety of the Panama Canal and its allied defenses. Officers of the CZAA are Robert Marstrand, president, William Clinchard, and E C Stroop, vice-presidents, and J. O Barnes, secretary-treasurer. At the present time there are two clubs on the Atlantic side of the Isthmus, using the Fort Davis Emergency Landing Field for their base One is the Cristobal Flying Club, having as officers Cyrus Roe, president, Ralph Pearson, vice-president, and E C Stroop, secretary-treasurer The other club calls itself the Atlantic Aeronuts, with Gerald D Bliss, Jr, Robert Pearson, and R B. Hayes Stroop, Jr, as officers

• The Central New York Airways school for motorless flight at Elmira has transferred its activities to Miami Municipal Airport for the winter Under the personal supervision of Warren E. Eaton, the instruction will provide a complete course in gliding, enabling the student to earn both his A and B licenses, and preparation for soaring. The staff will include E R. Southee, of the Elmira school and Harold Bowen who has been the instructor at the company's Norwich school for gliding and plane flying for a number of years

• Two complete training courses with a tuition value of $6,800 at the Boeing School of Aeronautics have been announced as the awards for the sixth annual W E Boeing scholarship competition The first award is to be a Boeing Airline Pilot and Operations course, and the second is the Boeing Airline Technician course supplemented with 25 hours of flight instruction Students at universities, colleges, and junior colleges during the school year 1934-5 throughout the United States and Canada are eligible to compete for these prizes which will be awarded on the basis of essays covering subjects approved by officers of the Boeing School The committee of award is headed by Dr Baldwin M Woods, chairman of the Department of Aeronautical Engineering at the University of California The competition will close March 15, 1935

The school has also announced a similar competition open to high school students in California, Oregon, and Washington, to be known as the Junior W E Boeing scholarship award The prizes consist of a two-year airlines operations course, and a one-year airline mechanics course Each course will include 25 hours of flight instruction

• Sixty-four airplanes of all types and sizes including three autogiros competed Nov 11 in a treasure hunt staged by Clarence Chamberlin starting from Holmes Airport, Brooklyn, N Y. Sealed instructions were distributed just before take-off to be opened in the air, and the contestants scattered all over Long Island searching for clews which included a piece of airplane fabric, a post-card and two cent stamp, and a wedge of pie John Abuiso, manager of Harrisburgh Airport, won first prize of $250, having found all the clews and finished the pie in the elapsed time on the ground of 28 minutes, 35 seconds. Second prize of $100 went to George W Edwards of Flushing Airport, L. I, and Annette Gipson of Roosevelt Field won the $50 third prize Seven $25 prizes were also awarded

60,000 SPECTATORS

and 83 planes turn out for dedication of new airport at Bloomington Ill Built with federal and municipal funds as a CWA project, under the supervision of the Illinois Bureau of Aeronautics, the airport comprises 164 acres has 35 900 sq ft of macadam runways, and a modern brick and steel hangar

SIDE SLIPS

By Robert R. Osborn

This and That and A Happy New Year

As WE have always been a lover of all of the old-established traditions, it brings a tear or two to our eyes to note the complete disregard by our rapidly-expanding air transport lines of the time-honored customs of the rail transportation systems Take the matter of handling baggage or express, for instance, the next time you see it being loaded on an air liner take particular note The expressmen actually *hand* the packages from one to another,—no crashing them from the truck into the baggage compartment, no dropping of the heavier cases on top of the cardboard boxes containing eggs or lemon meringue pies, no bashing in of the corners to see what's inside

Consider also the matter of the new Condor sleeper planes,—we haven't had the chance of trying them out as yet, but we understand that the loose couplers between cars which enable the railroad engineers to bounce the sleeping passengers out into the aisles at each starting and stopping, have been eliminated We presume that the airplane pilot has to get all of his fun out of bad landings or in flying through rough air.

There's another point which we are looking forward to checking on those sleepers,—the number of blankets supplied for each passenger We wonder if the air sleepers have been able to achieve the finer points about freezing the passengers which are now within the skill of the Pullman Company Each night on a Pullman we ask the porter for an extra blanket and are always told that the correct number of blankets for that climate and season have already been placed in our bunk Gullible soul that we are, we always believe the porter and turn in with the equipment specified in the Pullman porter's handbook, and invariably have to ring for the extra blanket at 2 a.m and then have to add our overcoat to the heap at 4 a.m. An occasional check-up with other passengers indicates that their reactions are about like ours,—so we are wondering if the airline sleeper blankets have been calibrated by the same polar explorer who did the job for the Pullman Company

Another point on which custom is being shattered is in the matter of tickets This summer we bought a ticket which took us on three days of flying through four countries, the time required for writing out the ticket and making change being not over ten seconds So far as railroad tickets are concerned,—who hasn't fussed and fumed in line at the ticket window, with only twenty minutes to train time, while the agent filled out forms somewhat resembling State Income Tax Forms?

As we say, it is sad to see so many of these customs going by the board, and we only hope that historians make

proper note of them as they go, so that our grandchildren will know what funny institutions the railroads were

We read that, for flying *7,700* miles to a new non-stop, non-refueling record a Russian aviator has just been given the rank of "Hero," the newest in Russian titles In this country, of course, this rank has always been an unofficial one, but if it ever is adopted we think that equally uncomplimentary titles should also be made official For instance, we are sure that the aeronautical industries would be glad to suggest some appropriate titles for Postmaster General Farley, Senator Black and Senator Nye.

Speaking of the aforementioned government officials reminds us of that old story about President Lincoln, when someone complained to him that one of his successful generals was a very heavy drinker Lincoln is supposed to have said that he wished he could obtain the same brand of whiskey for his other generals On the same basis we are wishing again for the good old days of "corruption, collusion and graft" which produced airplanes and engines which could prove themselves so outstanding against all of the rest of the world in the MacRobertson Race

According to the papers a Russian has arrived at a new "official" loop-the-loop record for gliders,—227 times in a four hour flight This suggests the possibility of a new project which would be developed by the PWA or the FERA —Official Loop-the-Loop Counter for Gliders.

Always having the welfare of the general public uppermost in our mind, we'd like to suggest as another idea for the alleviation of suffering by humanity, the elimination of trophy presentations of all kinds Judging by the great efforts always put forth to win trophies in competition,—golf, tennis, steeplechasing, basketball air racing, etc., one would expect the winners to be very glad to finally receive the trophy However, from occasional attendance at trophy presentations, and from seeing many photographs of other trophy presentations, we have arrived at the conclusion that it is a very painful process Miss Helen Wills always appeared as if she almost couldn't stand the ceremony and unless it got over soon she certainly was going to scream. Tilden and Vines always had expressions on their faces indicating that it was distinctly a favor on their parts that they were accepting the trophy Golf champions always indicate that the distasteful ceremony can't be over too soon to suit them Steeplechase riders always need "a lift from a Camel" after winning the plate And so it goes through the sports,—the Nov 7 issue of *The Aeroplane* of England shows a picture of "Air Chief Marshal Sir Edward Ellington presenting the Wakefield Trophy to Flying Officer J. T Brown, captain of the Henlow 'A' Team, which won the senior champion-

ship," both gentlemen being about to burst into tears

Inasmuch as we've never won anything more impressive than a soup ladle in the third class handicap golf tournament of our country club, we shall probably be accused of "sour grapes," but if trophies must be awarded, by all means have them sent parcel post to the winner, say we

This being the Happy Yuletide season, we probably should have turned out a column full of good cheer and good will toward men However, if the reader had any conreption how many times the Editor has telegraphed for this copy, how scarce usable material seems to be and how far we're going to have to drive to mail this column after it is completed, he would sympathize with the state of mind reflected in these writings

However, everything considered, and what with this and what with that, we're willing to let bygones be bygones, and wish a very Merry Christmas and Happy New Year to everyone, including the Editor

FLYING EQUIPMENT

Giros Advance

FEW THINGS are so difficult in this world as for a celebrity to withdraw voluntarily from the public scene and re-emerge at will to greater triumphs. That the American autogiro industry has been able to do it, is by no means the least remarkable of its achievements. For over a year almost nothing had been heard of giro activities. Compared to their previous popular notice, they had been nearly forgotten by the non technical press. Within the aeronautical industry it was generally known that the parent Autogiro Company of America had skeletonized its staff, that the Pitcairn and Kellett factories had practically ceased all production of their stock models and were devoting their efforts to developing new designs which were to be similar to the ship tested by Pitcairn in the spring of 1933 and to those which have appeared in England over the past few seasons. But the date of the ultimate return to full activity seemed until a few weeks ago as indefinitely in the future as it had ever been.

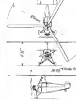
It would now seem that that date had been fixed as in the early part of November 1934, for during the short interval since then both factories have released the design details of their ships, the Pitcairn has been demonstrated in Washington and has landed and taken off from a pier end in New York harbor, and the Kellett has undergone its first tests preparatory to being submitted to the Air Corps. From the operators, too, have come announcements of new developments of the giro as an ideal craft for general dusting purposes and of new and widespread extension of sign towing activities.

There is a great deal to be learned anew about giro design from a study of the new models. Both, of course, are of the direct-control tiltable-rotor-hub type. Both are wingless and without elevators, though they do retain vertical and horizontal stabilizing surfaces. Each mounts a diminutive rudder more for use in developing and testing work than from necessity in normal flying maneuvers. From them both have disappeared the old inter-vane wires and damping units, the four-bladed rotor systems giving way to three-blade affairs which can be folded back along the fuselage to permit remarkably convenient storage.

The direct control and the elimination of the wings effect most vital changes in giro performance. Most important are that they permit full control at the characteristically low landing speeds of the autogiro descent, decrease the structural weight and markedly improve the load carrying performance. The giro principle has always been one of the most promising of aircraft design conceptions. The two craft now presented should go a long way toward redeeming some of those promises.

The Pitcairn PA22. A side by side two place cabin design, it is powered with the 75 hp. Type R geared Pobjoy engine. With full direct control at all speeds secured from tilting of the rotor axis it has a top speed of 105 m.p.h.

The Kellett K-D-1. A tandem open cockpit type, it mounts the 225 hp. Jacobs L-4 engine, makes 125 m.p.h. of top speed, cruises at more than a hundred.



Three-view drawing of the Pitcairn PA22.

THE new Pitcairn is a small two place side by side cabin giro powered with a Pobjoy Type R geared engine of 75 hp. Despite its finished appearance and refinement of detail it is still considered by the Pitcairn Company to be more of an indication of their general goal than their ultimate production model. Many of its parts have undergone repeated changes during the past period of development, some of them are not yet beyond modification, but the craft has been designed to appeal particularly to the private owner and its more standardized successors will undoubtedly follow its general features.

As an indication of the results achieved by the new design approach we might say at the outset that the weight empty of the ship is 600 lb., its gross weight 1,140 lb. It has a top speed of 105 m.p.h., cruises comfortably at 90 and with its 17 gal. of fuel has a range of approximately 350 miles, an excellent performance for the horsepower for an aircraft of any type or landing speed.

The fuselage is set quite close to the ground in the landing position and somewhat more nearly horizontal than is common in airplane practice. The landing gear and tail wheel are of orthodox type though the former is placed exceptionally far forward and both have been designed with the capacity to absorb the loads of vertical descent. The stabilizer which is mounted a small distance above the fuselage also carries the two fin surfaces near its tips. The small rudder fitted directly on the end post of the fuselage structure is entirely below the plane of the stabilizer.

The visibility from the cabin is excellent. Plentiful windows in roof and sides, the absence of the fixed wing and the low position of the geared engine combine to make it so.

The rotor pylon is of the two-strut wire braced type, one leg joining the fuselage structure in front of the windshield, the other at the rear of the cabin. The rotor itself has three blades whose horizontal freedom at the hub end is damped by means of friction units mounted about the pin connection. The direct control results from tilting the axis of the rotor hub in any desired direction through a range of approximately 3½ deg. from its normal position. The tilting is effected through a stick hinged at the top of the cabin and connected to the hub through a system of pushrods and linkages. On the ground the stick is pushed forward and latched to a holding fitting, thus putting the rotor in low incidence at which it is least affected by wind gusts. The controls are fitted with bungees to permit hands off adjustment about all three axes. The small rudder, little used, is controlled through the usual foot pedals.

In normal take off the tail remains on the ground until after the front wheels have been lifted clear, since there is no fixed wing that must be put at small incidence to allow forward speed to be gained. Take off, which can be made at about 25 m.p.h. is achieved by simply increasing the rotor incidence without changing the fuselage attitude appreciably.

The inverted stick control of the PA22. When on the ground it is latched in a forward position thereby holding the rotor in low incidence to avoid trouble from wind gusts.

ALTHOUGH the two giros have many basic features in common there are also important differences which may be taken as an indication of the wide variety of applications we may expect from future giro development. The new Kellett is a comparatively large two place open tandem cockpit machine powered with a 225-hp. Jacobs L-4 engine. Its weight empty is 1,352 lb., its gross load 2,052 lb. It is designed to have a top speed of 125 m.p.h., cruise at 103, maintain its altitude at 16 m.p.h. Its rotor is 40 ft. in diameter. Its overall length with blades folded is 25 ft. 10 in. Distinctly it is aimed more at miscellaneous commercial and military services than at the private market intended for the Pitcairn.

The Kellett with two of the rotor blades folded along the third. With this feature the craft can be housed in a space 22x13x12 ft.

The landing gear is of double-fixed tripod type and appears particularly sturdy. The wheels move slightly inward as they travel upward during landings in order to better withstand side loadings.

The hub and pylon have been carefully housed in a fairing form to decrease aerodynamic drag and throughout the design the same care seems to have been used to secure the best possible performance. The control is of course similar to the orthodox airplane stick control hinging at the floor of the cockpit and has been designed to be as similar to airplane control as possible in effort of movement and longitudinal and lateral coordination.

The gasoline tanks are mounted in the sides of the fuselage somewhat after the Vought manner. The engine has been especially modified to improve the installation of the rotor power drive used before take off and the pump for the Heywood compressed air engine starter.

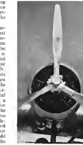
Automatic Pitch Control

THE word "uncanny" has very little place in technical literature, but it is difficult to find a better description of the behavior of Hamilton Standard's automatic control device for controllable pitch propellers. There is nothing supernatural about its action, of course, but unfortunately, the whole story of how it works must be deferred until the military sees fit to release it. What it can do, however, was amply demonstrated by Raycroft Walsh, Carl Shorey, A. L. MacClain and other officials of Hartford on Nov. 9. We had an opportunity to sit up in the cockpit of United Aircraft's Boeing 247-B to watch the thing work in flight.

The Hamilton Standard two-position controllable pitch propeller is too well known to need additional description here. To it has been added an engine driven governor which serves to regulate the oil flow to the cylinder which controls blade pitch angle. In flight, then, the oil control cylinder, instead of being held full out against the stops by engine pressure oil (for low-pitch position), or full in against the stops by the centrifugal action of the counterweight (for high-pitch position) is permitted to "float" against

a varying oil supply between the stop limits, and the blades, therefore, can assume an infinite number of pitch settings between the extreme high and the extreme low.

For any given airplane engine combination, adjustments are made so that for level cruising conditions the control piston floats in that intermediate position between stops which gives the proper blade setting for level flight at the desired r.p.m. If the plane is pulled up into a steep climb, normally engine r.p.m. would drop sharply. Actually, however, the initial drop in r.p.m. acts through the governor to admit pressure oil into the pitch control cylinder, the blades move toward a lower pitch position, and the r.p.m. stays at the original setting. Conversely, in a dive with a fixed pitch propeller, r.p.m. tends to rise sharply as air speed goes up. In the new propeller, however, the initial rise in r.p.m. actuates the governor to decrease oil pressure in the control cylinder, the blades assume a higher pitch position and the r.p.m. is held down to its original figure. In the demonstration flights it was possible to pull the Boeing 247-B out of level cruising flight into an 80-m.p.h. climb, then dive it out of the climb up to 190 m.p.h. with only a momentary deviation of the tachometer from the 2,100 r.p.m. at which the control had been set.



Hamilton Standard automatic controllable-pitch propeller installation on a Boeing 247-B transport.

Other demonstrations were equally convincing. It was possible to synchronize the engines perfectly by simple manipulation of the governor controls in the cockpit, and the synchronization (as evidenced by lack of beats) was held automatically over a wide range of flight conditions, including sharp turns and for extreme differences in power output between the right and left engines. In one case the intake manifold pressure on one side was reduced to 18 in. of mercury and on the other was opened up to the top allowable limits for the engine but the tachometer readings remained alike. Even when the two throttle settings were suddenly reversed, the deviation from r.p.m. setting was but momentary. With the automatic control in operation the only effect of throttle setting (within the limits of the control) is to change the power (intake manifold pressure) without influencing engine r.p.m. The propeller blades shift automatically to settings that maintain constant engine speed.

The control levers in the cockpit are similar to those used for the two-position controllable, but instead of being connected to the oil valves on the engines they are connected directly to the governors. On multi-engined ships they function independently (there is absolutely no interconnection between engines or governors) and permit an infinite selection of engine speeds over a range between 1,600 and 2,200 r.p.m. Engines may be started with the controls in any position. Idling and warming up speeds are usually below minimum speeds for which the governor is set, and hence blades stay in the lowest pitch position. This position is maintained while throttles are open wide on the ground unless the propeller control is set for some lower engine speed than is obtainable with the extreme low pitch, in which case the governor will increase the pitch just enough to absorb the power at the desired speed. For take-off the controls are normally set for maximum engine speed. During take-off, or soon after leaving the ground engines will attain the governing speed and will thereafter accommodate themselves to changes in altitude and throttle openings without further attention from the pilot. When engines are throttled during a glide, the blades automatically go into the low pitch position. If it is necessary to open the throttle again for any reason, both engines instantly go back to full allowable r.p.m. In emergencies, the pilot does not have to wonder about propeller pitch settings or to make any extra moves or pull any extra handles to be sure of developing his full available power on short notice.

The maximum cruising speed of the ship is obtained at 13,000 ft. when the engines are operated at 2,000 r.p.m. full throttle at 26½ in. manifold pressure. The same cruising can, of course, be obtained with a two-position propeller if the pitch is set for those conditions. As far as cruising is concerned, the advantage of the constant speed comes at intermediate altitudes. Assuming the two-position propeller is set for the performance indicated above, if it is necessary to fly at 5,000 ft., the constant speed propeller will give cruising speed approximately 6 m.p.h. faster than the two-position. At sea level the constant speed gives a cruising speed approximately 10 m.p.h. faster. The limiting manifold pressure is used in each case.

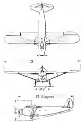
Although the constant speed propeller device is now undergoing extensive service tests both for the Army and Navy and on certain air lines, it is not yet available for general commercial distribution. Of particular interest, however, against the time when it can be released, is the fact that no changes are required in the existing controllable pitch propellers to apply the automatic feature. The propeller mechanism remains the same, all that is necessary is the substitution of an automatic oil valve for the hand control valve, and the installation of the governor device on one of the gun synchronizing pads of the engine. The installation increases the weight of each engine by but 5 or 6 lb.

The Fairchild XC-31 cargo carrier dwarfs the men who built her. Left to right: L. E. Reisner, W. H. Evers, M. L. Winters, A. A. Gassner

Fairchild Cargo Transport

NO VISITOR at Fairchild's Kreider-Reisner, Hagerstown plant during the late summer could have failed to have been impressed by one ship, then in the last stages of construction, whose huge bulk dominated the shop, making the Model 24's coming off the regular production line seem almost toy-like in comparison. A cargo carrier for the Air Corps, it was one of those things which, for itinerant editors, had to be officially "overlooked." Now, however, that the Air Corps has flight tested it to its satisfaction, the lid is off, and details may be discussed.

Basic requirement behind the design of XC-31 is the carriage of large loads, economically, at high speeds. It is not in the 200 m.p.h. class, but for a single-engined ship of its weight and bulk, it does amazingly well, having an official top of a little better than 160 m.p.h. Landing speed, full load, with Zap flaps full down, is 52 m.p.h., giving a very satisfactory speed range. Empty weight is 7,322 lb., useful load 5,678 lb., gross 13,000 lb. The ratio of useful to gross is thus about 41 per cent, a high figure for modern land transports. Payload is 3,600 lb.

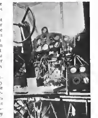


The ship is virtually a flying freight car. All of the luxuries of modern air transport have been dispensed with. The clear cargo space in the deep fuselage is 19 ft. long, 6 ft. 4 in. wide, and 6 ft. 4 in. high—almost 775 cu.ft. in all. When the ship is at rest on the ground the 5 ft. 10 in. x 4 ft. 11 in. cargo door is just at the right height and location to register with the tail board of a standard Army truck backed up alongside.

Floor and wall fittings have been installed for fastening down a wide variety of loads. Arrangements are available to handle spare air or liquid-cooled airplane engines in standard Army cradles or in regular packing boxes. Three Cyclones, boxed, complete with accessories, constitute a capacity load (by weight). All kinds of materials may be lashed to demountable stanchions, or to floor rings. For transport of wounded, six litters may be installed, three on a side, leaving plenty of aisle room for attendants at work, or for additional wounded to be carried on chairs. As a troop carrier, two arrangements are possible. Fifteen Army type chairs may be installed, or the folding benches built into the side walls may be let down to seat fourteen men. Their military equipment can be lashed to the floor in the aisles. For delivery of emergency food or supplies, a large cargo chute has been installed from which containers may be ejected, to parachute to the ground.

The single pilot's seat is in a closed cab high up in the nose, from which the range of vision in essential direction seems to be adequate. It is reached by a short ladder through a door in the forward bulkhead. All necessary navigational equipment is installed, and the communication facilities are unusually complete. Standard radio transmitting and receiving sets are supplemented by a Type A-4 radio compass. The mast antenna is quickly demountable from inside the cabin, and the radio directional loop is semi-permanently installed. Indicators on the board show the position of the flap and the retracting landing gear. A stick vibrating device warns against landing with wheels up or when the gear is not fully locked in place.

Interior of Fairchild's flying freight car. Note built in floor fittings and pull down benches in the walls



The control cabin is fitted with all modern navigation and communication devices. Flap and landing gear indicators appear in center

Military requirements dictated many design decisions. For example, to insure maximum clear cargo space and large door opening, the round cornered or elliptical monocoque fuselage with the combined cantilevered wing was rejected in favor of the squared-up welded steel tube body with a comparatively thin externally braced wing. To stand up under rough landings in unprepared fields, the undercarriage and fuselage underbody were made extremely rugged. The entire wing stub structure can be unbolted as a unit for replacement.

In construction and in the usage of materials, XC-31 is fairly conventional throughout. Every part of the ship is protected against corrosion by suitable means—oil, cadmium plating or anodic treatment. All movable surfaces, retracting mechanisms and control systems are mounted on ball bearings. Most interesting detail is the retracting landing gear design, but unfortunately that is the one feature that cannot be released for full discussion at this time. The 40x10 streamlined wheels are mounted on combined oleo-pneumatic shock struts. They fold inwardly (electric motor operated with auxiliary hand control) into recesses in a short stub wing. The tail wheel is carried on a standard Army type half fork, and is fitted with an Aerol strut.

Fuselage is of welded steel tube

throughout, fabric covered. Fin is metal framed, bolted to fuselage. Rudder and elevators are aluminum-alloy framed, with metal nose pieces, and fabric covered. Fin and stabilizer are fixed, longitudinal and directional trim being obtained by adjustable trailing edge tabs on the moving surfaces.

Wings are all dural framed (except for steel tube and wire drag bracing), fabric covered. Spars are of the single solid web type with extruded angle flanges. Nose piece is of sheet metal reinforcement by longitudinal stringers and nose ribs. It is riveted to the front spar flanges, top and bottom, and thus becomes a real structural member, adding considerable torsional rigidity and strength to the wing. Ribs are constructed of channel section cap strips with square aluminum tubing web members, assembled by small cross-shaped forgings and rivets. Duralumin brackets from the rear spar carry the Zap flap and aileron supports. Ailerons are of the Frise pattern, aluminum framed, fabric covered. They are differentially operated, 40 deg. up, 15 deg. down.

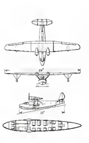
Power plant is a single R 1820-25 Wright Cyclone swinging a three bladed Hamilton Standard controllable pitch propeller. Fuel is carried in the wings in three 75 gal. tanks. The supply is adequate for five hours' cruising.

Sikorsky S-43

WHEN S-42 was undergoing her flight trials early last summer we were permitted a glance behind the canvas screens that surrounded the mock-up for the next Sikorsky, just announced as S-43. Although far from complete at that time, work had progressed sufficiently to suggest distinct relationship to the S-42, a fact further confirmed by recent releases.

Where S-42 has a span of 114 ft. and a gross weight of 38,000 lb., the new ship shows 84 ft. and 17,541 lb. It is not entirely, however, a scaled down edition of its predecessor, for it is an amphibian (the landing gear may, of course, be omitted if only flying boat performance is required), it has two, instead of four, engines, and in some respects (particularly in the wing) its structure is basically new. Many of the features successfully developed for S-42 have been used again, such as the trailing edge flap with its automatic load limiting control (AVIATION, August, page 249), the "tower" mounting for the wing, the narrow hull with outboard floats, flush rivetting on the hull, etc.

Little is known so far of the actual details of the hull structure, although it will probably resemble that of S-42. It is of a semi-monocoque pattern built of anodic protected dural. There are four main bulkheads, making five watertight compartments, any three of which, undamaged, will float the whole machine.



The bow compartment includes a large deck hatch for mooring and contains the anchor and a hand operated winch.

Landing wheels retract into recesses in the sides of the hull about ⅓ of the way back from the bow. They are of the streamlined low-pressure type, 45 in. diameter, with smooth outside surfaces. About ⅓ of their thickness projects into the air stream when in the up position. The welded steel tube struts and retracting mechanism are housed in compartments in the hull. Parts of the mechanism are interchangeable right and left and are readily accessible for maintenance or for removal for flying boat conversion. Hydraulic shock struts are fitted, and brakes are hydraulically operated. The tail wheel, also retractable, uses an 18-in. low pressure tire, is fitted with a hydraulic shock strut, swivels 360 deg. Retraction time all wheels twelve seconds.

The plane has been designed to accommodate two Pratt & Whitney Model E Hornets rated at 750 hp. at 7,000 ft. It is interesting to note that Hamilton-Standard constant r.p.m. controllable pitch propellers are specified (see description page 409). Engine mounts are of the conventional welded steel type variety, removable as a unit, and interchangeable. Fuel for each engine is normally carried in two 100 gal. elliptical tanks (rivetted dural) in the wings. A 15 gal. tank of similar construction takes care of the oil for each engine. All cowling is readily removable for servicing. Convenient steps, hand holds and platforms (see AVIATION, August, page 273) are provided for use of mechanics.

The wing design differs from former Sikorsky practice in that it has a single box type metal spar. This member is located well forward, at about the normal center of pressure position. The entire leading edge is removable for inspection purposes. The wing is in three parts—a center section supported on the "tower" and strut braced to the hull,—and two cantilever tip sections. Engines, tanks, controls, etc., all come in the center section. The trailing edge flap extends from aileron to aileron. The tip sections carry the wing floats. Ailerons are inset,—balanced. All controls are cable operated—hinges and pulleys being ball bearinged throughout. Structural wing parts are metal,—covering is fabric. Tail surfaces are of similar construction. Stabilizer is adjustable. Elevator is in one piece for rigidity, is metal and dynamically balanced. Rudders are balanced by means of automatic trailing edge tabs.

The interior accommodations are, of course, convertible to meet any required conditions. Standard arrangement is shown in attached drawing. Standard equipment is exceptionally complete. Load distribution in the table. General specifications follow:

Span, 84 ft. 0 in., height, 17 ft. 9 in., length overall, 50 ft. 5 in.; total wing area, 775.0 sq.ft., gross weight, 17,541 lb., power loading (per b.hp.), 11.7 lb., wing loading, 22.63 lb. sq.ft.

Cruising speed at sea level, 75 per cent b.hp., 167 m.p.h.; cruising speed at 1,000 ft., 70 per cent b.hp., 165 m.p.h.; cruising speed at 8,000 ft., 75 per cent b.hp., 181 m.p.h.; high speed at sea level, 186 m.p.h.; high speed at 7,000 ft., 200 m.p.h., stalling speed at sea level, 65 m.p.h.; high speed, one engine, 7,000 ft., 125 m.p.h.; initial rate of climb, 1,250 ft. per minute.

Load Distribution of the S-43

	Standard		Maximum Passenger Capacity		Long Range Mail	
	Amphibion	Seaplane	Amphibion	Seaplane	Amphibion	Seaplane
Range in miles 1,000 ft.-altitude 70 per cent b.hp.	750	1,000	390	675	2,000*	2,500*
Gross weight (lb.)	17,541	17,541	17,541	17,541	17,850	17,850
Weight empty (lb.)	9,821	9,071	10,019	9,111	9,686	8,736
Useful load (lb.)	7,720	8,470	7,522	8,430	8,164	9,114
Crew at 170 lb.	3	3	2	2	3	3
Gas at 6 lb. (gal.)	400	550	210	360	925	1,083
Oil at 7½ lb. (gal.)	24	24	24	24	64	64
Pass. at 170 lb.	15	15	25	25		
Baggage (lb.)	750	750	750	750	90	90
Mail and express (lb.)	700	550			1,000	1,000
Equipment (lb.)	830	830	750	750	514	514

*Based on 12,000-ft. altitude at 105 m.p.h.

THE MAINTENANCE NOTEBOOK

In Cooperation with the Maintenance Committee of the Aeronautical Chamber of Commerce

Portable Supply Locker

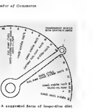
READERS will recall a portable ship cleaning cabinet developed at Pan American's Brownsville Base and described in this department some months ago. A somewhat similar device has been worked out at T.W.A.'s Kansas City hangar for keeping track of passengers' supplies which must be on board every ship before departure. Built of wood, mounted on four large rubber-tired wheels and equipped with convenient handles, the locker may be rolled up to the door of the plane where the supplies are conveniently available to the servicing crew. The locker is divided into two parts. The lower part is made up in the form of two large bins, one for waste and the other to hold a supply of new cardboard containers. The upper section is arranged with a number of pigeon-holes like an old-fashioned desk in which maps, timetables, packets, etc., are stored. The under part of the lid makes a convenient bulletin board for the posting of instructions to servicing crews.

Propeller Workstand

A CONVENIENT arrangement for holding propeller assemblies during overhaul is submitted by Mr. Leo D. Cox, in charge of propeller overhaul at the Naval Air Station at Pensacola, Fla. The support consists of a two-way air cylinder with piston rod extending upward through the center of the table. A metal bracket supports the propeller hub in open forks. (Separate brackets are available for two or three bladed propellers.) After the hub has been placed over the end of the piston rod and dropped into the forks, a flat key is inserted in a slot in the end of the clamp shaft. When air is admitted above the piston it draws the flat key against the top edge of the propeller hub and holds the assembly firmly in place. Clamping control is by means of a two way valve mounted immediately below the table top. The whole mounting is rotatable about the center so that the propeller can be swung to the most convenient working position.

Inspection Reminder

FOR the privately owned or military ship which does not fit into a routine day-by-day maintenance procedure, and which may be away from its base on extended trips, it is of importance that the pilot or mechanic has some sort of reminder of jobs that require periodic checking. From Lt. H. C. Downey, maintenance officer at Mitchell Field, L. I., comes a helpful suggestion for such cases. He proposes that an inspection dial be permanently mounted somewhere on the plane or on the engine. The dial would be marked off in hours (from 0 to 100) around its edge and the several items which should receive attention at regular intervals be marked on the face of the dial on radial lines corresponding to the hours. The dial carries a transparent pointer. Before making an inspection, the mechanic



A suggested form of inspection dial

would check from the log book the number of hours flown since overhaul and would set the pointer accordingly. He would then read directly the items which were due for attention at that time.

Fire Extinguisher Dolly

A CONVENIENT way for mounting pressure type fire extinguishers for use around fueling pits and hangars has been worked out by Eastern Airlines' shops at Atlanta. The dolly is of very simple construction, made up of short pieces of steel tubing, a small piece of ¼ in. steel plate, and a pair of iron wheels. The long curved handle makes it easy to push about, and it takes up very little floor space when not in use.

TWA's portable supply cabinet. Right: Propeller workstand in the Naval Air Station at Pensacola.

Eastern's simple dolly for pressure fire extinguisher

THE BUYERS' LOG BOOK

AVIATION'S *Card Index of New Equipment*

This department is equipped to help readers locate manufacturers of any parts, accessories or materials

AIRPORT EQUIPMENT — **Tractor**

Clark Tructractor Company,
Battle Creek, Mich

"CLARKTOR-6," ("Speed" model), a new all-purpose tractor applicable to general airport and hangar service has a 46 hp six-cylinder power plant. Develops 1 lb of drawbar pull for every pound of weight Speeds range up to 18 m p h Full lighting equipment for 24-hour service Includes self-starter, generator, battery, horn, front bumper plate, coupler, pneumatic tires Extra equipment available.

AVIATION, *December, 1934*

SHOP EQUIPMENT — **Piston pin gage**

Wilkening Manufacturing Company,
Philadelphia, Pa

A DIRECT reading tool (manufactured by The Circle Gauge Company of Los Angeles) is offered for accurate measurement of piston pin, bushing, or bolt diameters. Part to be gaged is inserted between spring loaded jaws and diameter is shown on direct reading scale under magnifying glass. Three sizes for pins, 0 to ½ in , 0 to 1 in , ½ to 1½ in. diameter

AVIATION, *December, 1934*

MATERIALS — **Floor resurfacer**

Stonhard Company,
401 North Broad St , Philadelphia, Pa

CONCRETE, wood, brick, asphalt or composition floors may be repaired or resurfaced for truck traffic in 36 hours by means of a new material known as Stonhard Resurfacer It provides a tough, resilient surface which is waterproof, dustless, non-skid Application is made with ordinary trowel. Extensive preparation is unnecessary and any handy man can make repairs to all types of floors.

AVIATION, *December, 1934*

SHOP EQUIPMENT — **Portable shear**

Stanley Electric Tool Company, Inc ,
New Britain Conn

UNISHEAR No 144 is a power-driven hand tool which cuts sheet metal up to 14 gage hot-rolled steel at speeds up to 15 ft. per min., straight lines curves, angles, notches Can make inside cuts by punching 3 in hole Furnished with rubber covered cable, swivel handle, wrenches Operates on d c or a c. 60 cycles or less, voltages 110, 220, 250 14½ in long, weighs 19½ lb

AVIATION, *December, 1934*

MATERIALS — **Welding flux**

Handy & Harman,
82 Fulton St , New York City

"HANDY FLUX," which has been developed for brazing ferrous or non-ferrous metals, has a low melting point and permits taking advantage of solders and alloys having low flow points It works over wide temperature range, spreads rapidly, assures even distribution of solder Residual slag washes off readily with a little hot water Paste form, ready for use, in ½, 1, and 5-lb jars

AVIATION, *December, 1934*

SHOP EQUIPMENT — **Welding timer**

General Electric Company,
Schenectady, N Y

A NEW synchronous-motor-operated timer, CR 7993, for automatically timing power supply to resistance welders, eliminates inaccuracy Once set, the time is unaffected by line-voltage variations or surges After each operation the timer resets automatically for the next weld Range of from 1/12 to 5/6 of a second in one-cycle steps (60-cycle supply) is possible Several forms available.

AVIATION, *December, 1934*

SHOP EQUIPMENT — **Milling machine**

Van Norman Machine Tool Company,
Springfield, Mass

A NEW machine for tool room or machine shop Cutter head adjustable for vertical and horizontal milling and angular settings over 90-deg range Detachable subhead permits milling at any angle over full table travel Motor-driven, anti-friction bearings throughout. Cutter speeds from 70 to 1465 r p m. Higher speeds can be obtained if desired Literature available on request

AVIATION, *December, 1934*

SHOP EQUIPMENT — **Welding timer**

Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa

A PORTABLE ignition welding timer, for accurate timing of all types of resistance welding machines (aluminum alloys and high strength steels), will pass electrical current for periods as short as 1/60 second and is adjustable up to 1/2 second 46 in high, 42 in long, 29 in wide, weight about 700 lb carries electrical energy in magnitudes as high as 700 kv-a 440 volts (60 cycle) single phase.

AVIATION, *December, 1934*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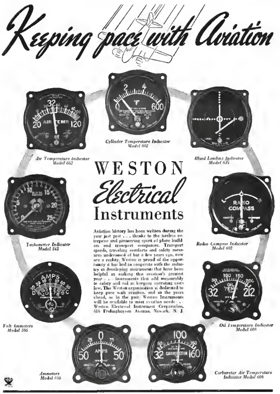
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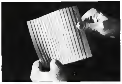

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Hand Inertia Starters • Electric Inertia Starters • Direct Cranking Electric Starters • Hand Turning Gears • Retractible Landing Gear Motors • Air Injection Starters • Battery Charging Generators (voltage regulated) • Double Voltage Radio Generators (voltage regulated) • Radio Dynamotors • Engine Driven Radio Dynamotors (voltage regulated) • Engine Driven Alternators (constant speed) • Engine Driven Vacuum Pumps (for Navigating Instruments) • Battery Booster Coils • Automatic Supercharger Regulators • Booster Magnetos • Fuel Flowmeters • Superchargers • Automatic Pitch Propeller Hubs • De-Icer Equipment • Flexible Metallic Tubing.

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NEARLY all the air-lines of the world utilize Eclipse-manufactured generator and dynamotor equipment for lighting and radio communication facilities, in addition to starters and other Eclipse devices.

The fundamental qualities of reliability, ruggedness and superiority are essentials of Eclipse products and as such have won universal recognition.

The understandable pride of Eclipse craftsmen in this universal esteem serves greatly to sustain the high standards of quality which have built that esteem.

ECLIPSE AVIATION CORPORATION

(Subsidiary of Bendix Aviation Corporation)

EAST ORANGE, NEW JERSEY